NOVEMBER, 1951 Vol. 40, No. 9

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INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

The Shop Teachers' Professional Magazine

Tomorrow's skilled shopmen must know how COLOR DYNAMICS improves production techniques

MANY educators in industrial and vocational schools now include Pittsburgh COLOR DYNAMICS in their training of skilled shopmen. They recognize that this knowledge will be of great help to students in their future tasks.

● **Executives in industry** are becoming increasingly aware of the importance of physical and psychological factors upon workers and their output. They recognize that some colors stimulate, others are restful, still others depress—even cause irritation and discomfort.

● **Pittsburgh's** system of COLOR DYNAMICS makes use of this *energy in color* scientifically and systematically to improve production and enhance the welfare of workers.

● **By the proper** application of COLOR DYNAMICS on machines, the operator's attention is focused better on his task. By the use of *focal* colors, working parts are separated from stationary parts and the material being fabricated. This reduces eye travel which is one of the causes of eye-fatigue and lessened efficiency.

● **Use of *eye-rest* colors** on walls and ceilings further relaxes the eyes of workers. *Morale-building* colors promote cheerfulness and cause a worker to show greater interest in his task. *Safety* colors reduce accident hazards.

● **In hundreds of plants** where COLOR DYNAMICS has been applied, more work per man-hour and more man-hours per man have resulted. Absenteeism has been reduced. Relations between management and workers have been bettered.

● **These are factors** in industry with which the skilled shopman of tomorrow must be familiar. If you wish your students to be better equipped for the future, begin now to teach them COLOR DYNAMICS.

● **Write today** for a free copy of our booklet which contains a full explanation of COLOR DYNAMICS and how to use it. Better still, demonstrate its principles in a practical manner by painting one or two machines in your classrooms.

We'll Make a Free Color Engineering Study of Your Classrooms

● Should you desire a COLOR DYNAMICS analysis of your manual training rooms—we'll be glad to make one *free* and without obligation. There's a color engineering expert at each of our offices in principal cities. A call will bring him to your school at your convenience. Or mail this coupon.

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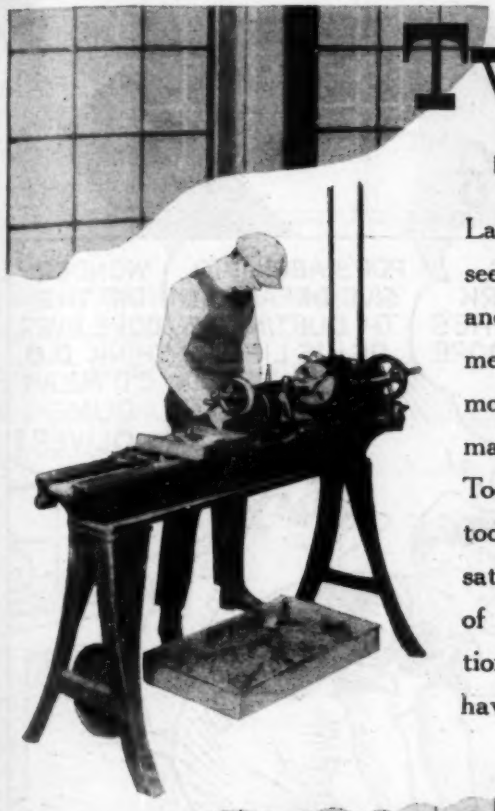
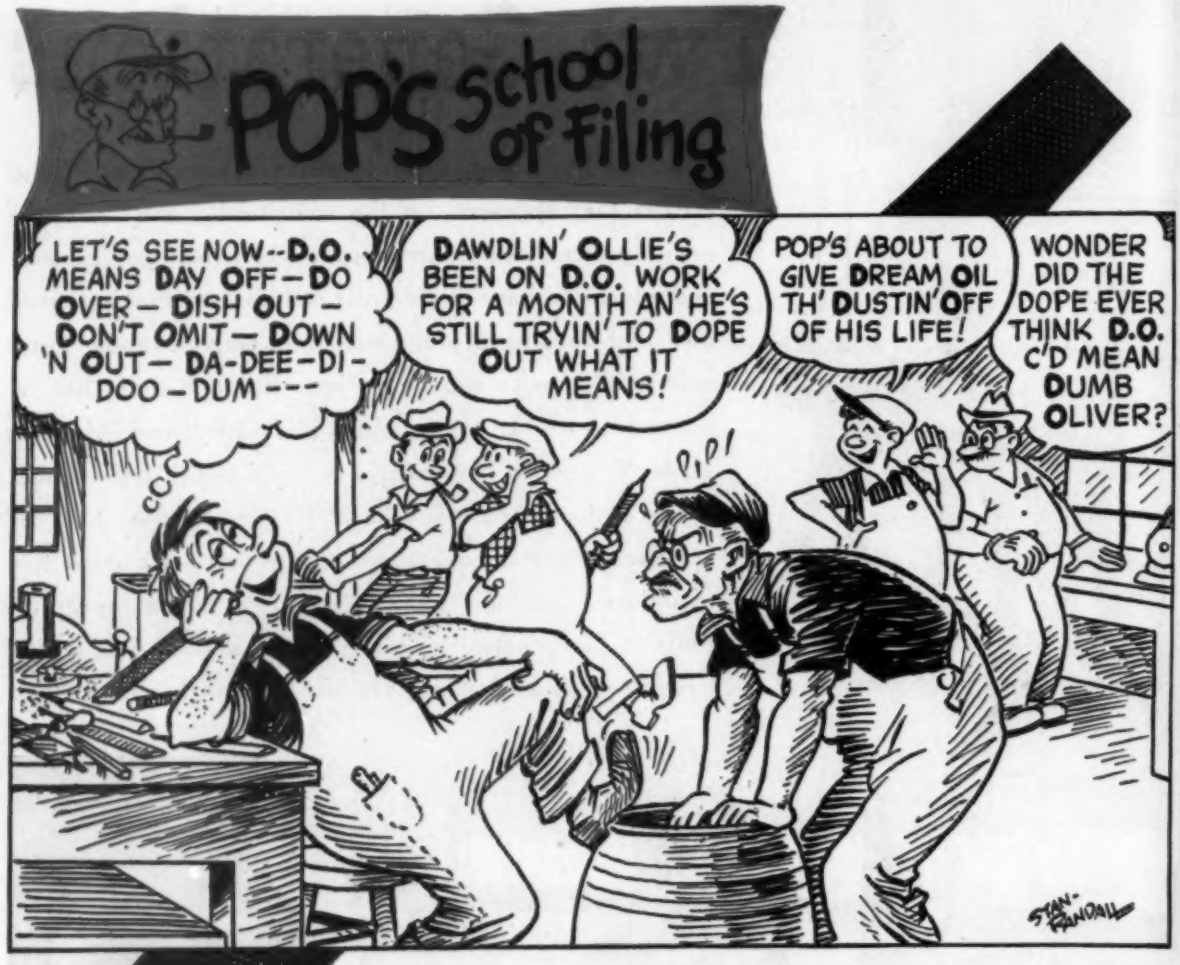


There have been a lot of changes since South Bend Lathes first appeared on the industrial scene. We have seen presidents, kings, and dictators come and go; industry and education have made great strides, and the dreams of men and boys have progressed from single cylinder automobile engines to supersonic jets. But one thing has remained constant, the quality of South Bend Machine Tools. Whether a boy learned to run a South Bend Lathe today or forty years ago he and his instructors had the satisfaction of knowing the machine was a standard tool of industry, and designed to meet the highest specifications of his generation. Industrial leaders of our nation have been, and are being trained on South Bend Lathes.

SOUTH BEND LATHE WORKS

BUILDING BETTER TOOLS SINCE 1906 • 425 EAST MADISON STREET, SOUTH BEND 22, INDIANA


POP'S school of Filing
LET'S SEE NOW--D.O. MEANS DAY OFF—DO OVER—DISH OUT—DON'T OMIT—DOWN 'N OUT—DA-DEE-DI-DOO-DUM---
DAWDLIN' OLLIE'S BEEN ON D.O. WORK FOR A MONTH AN' HE'S STILL TRYIN' TO DOPE OUT WHAT IT MEANS!
POP'S ABOUT TO GIVE DREAM OIL TH' DUSTIN' OFF OF HIS LIFE!
WONDER DID THE DOPE EVER THINK D.O. C'D MEAN DUMB OLIVER?
STAN RANDALL

Of course, only a cluck of Oliver's cranial capacity would fail to understand that D.O. means Defense Order . . . and that Uncle Sam wants no antiquated methods or low-grade tools slowing up *his* vital production jobs. Nor do industrial managements themselves.

Take filing operations. They represent production and assembly processes where poor results and untold man-hour losses can be incurred through the use of quick-dulling files of low-quality steel, haphazard cut and unscientific hardening.

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• • •

There's a valuable lesson in the above for industrial training students aiming to advance from mechanic to production engineer or factory superintendent.

• • •

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Vol. 40 No. 9

NOVEMBER, 1951

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

Published on the 15th of month preceding date of issue

THE BRUCE PUBLISHING COMPANY, 400 North Broadway, Milwaukee 1, Wis. • CENTRAL OFFICE: 20 North Wacker Drive, Chicago 6, Ill. • EASTERN OFFICE: 225 Broadway, New York 7, N. Y.

★ ★ ★ ★

This Month's Cover

The picture on the November cover of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine shows students of the Senior High School of Richmond, Ind., getting an introduction to the milling machine in their study of machine-shop practice.

When these students finish their course they will, no doubt, know how to operate the lathe, the shaper, the grinder, and the milling machine. To most students the milling machine is the most interesting of the various power tools which they have studied.

A. R. Sears is the instructor and the photograph is from the *Register*, Richmond, Ind.

Give to Your Community Chest

★ ★ ★ ★

Entered January 2, 1914, as Second-Class Mail Matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright, 1951, by the Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, November 25, 1930. Published monthly except during July and August.

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Articles Indexed. — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

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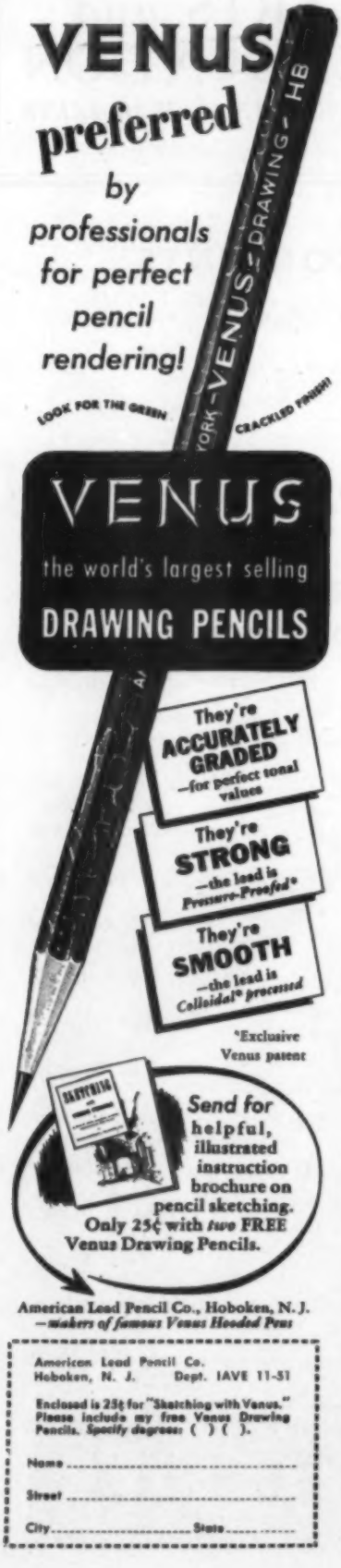
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ASSOCIATION NEWS

COMING CONVENTIONS

Oct. 25. Indiana Vocational Association, at Arsenal Tech, Stuart Hall, Indianapolis. Secretary: Glen Barkes, 802 E. Market St., New Albany, Ind.

Oct. 26. New Mexico Vocational Association, at Albuquerque. Secretary: L. C. Dalton, State Supervisor of Agricultural Education, Box 98, State College, N. Mex.

Oct. 26–27. Four-State Industrial Arts and Vocational Education Conference at Kansas State Teachers College, Pittsburg. Secretary: J. V. Melton, Kansas State Teachers College, Pittsburg, Kans.

Nov. 1–3. Wisconsin Industrial Arts Association, at Milwaukee, Wis. Secretary: Harlan Shufelt, City Hall, Racine, Wis.

Nov. 2–3. New England Industrial Arts Teachers Association, at Hotel Vermont, Burlington, Vt. Arthur I. Martin, State Teachers College, Gorham, Me.

Nov. 8–10. Industrial Arts Conference at La Salle Hotel, Chicago, Chairman: Dr. Verne C. Fryklund, President, The Stout Institute, Menomonie, Wis.

Nov. 26–Dec. 1. National Association of Industrial Teacher Trainers, at Curtis Hotel, Minneapolis, Minn. Secretary: W. M. Bateson, Room 4200C, University High School, Ann Arbor, Mich.

Nov. 26–Dec. 1. Minnesota Vocational Association, at Minneapolis. Secretary: R. Fausch, Minn. Vocational School, Minneapolis, Minn.

Nov. 27–30. American Vocational Association, at Minneapolis, Minn. Secretary: Dr. M. Mobley, 1010 Vermont Ave., N.W., Washington, D. C.

Dec. 4–6. American Technical Education Association, at Minneapolis, Minn. Secretary: R. W. Howes, Bureau of Vocational Education, State Office Bldg., Hartford, Conn.

MU SIGMA PI MEETING

♦ The June 1 meeting of Mu Sigma Pi Fraternity was called to order by President O. Rowland Scott at 8:15 p.m., in the Faculty Lunch Room of the Wayne University Student Center, Detroit, Mich.

After a short business meeting, A. C. Good showed movies on welding and a high speed film showing the speed of an arc. These were in technicolor and were of great interest to the group. Then refreshments were served after which a welding demonstration was given under the direction of Mr. Good.

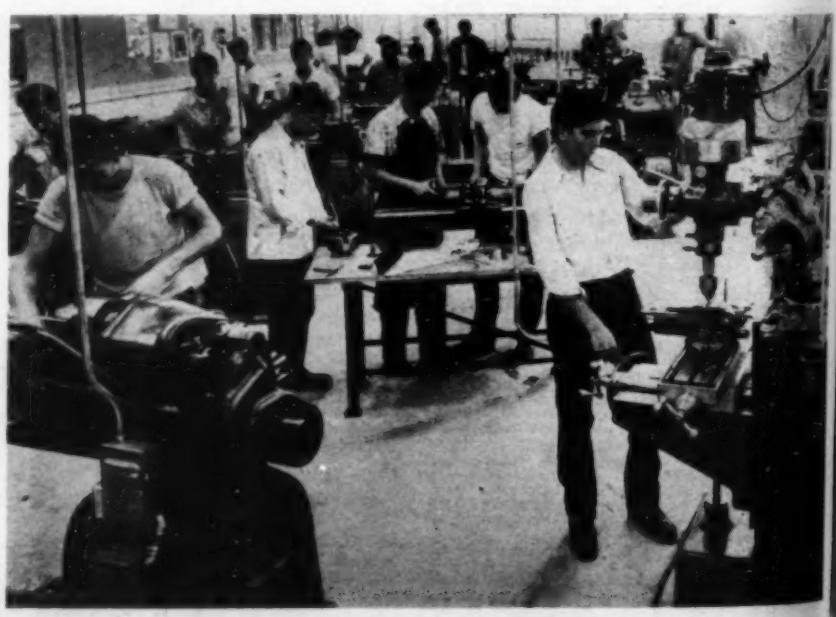
Personal News

♦ Dr. Verne C. Fryklund, president of The Stout Institute, Menomonie, Wis., has been made a member of the Advisory Council for Child Research at Mooseheart, Ill.

♦ Dr. George F. Zook, who was born at Fort Scott, Kans., in 1885, died in Arlington, Va., on August 17, 1951.

Dr. Zook received his bachelor's degree at the University of Kansas in 1906, the master's degree in 1907, and the Ph.D. from Cornell University in 1914. He also received the Litt.D. degree at

(Continued on page 6A)



Advanced machine shop students, Tucson Senior High School, Tucson, Ariz.

— Submitted by Harry A. Goldstein, instructor of photography

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PERSONAL NEWS

(Continued from page 4A)

Boston in 1934, the LL.D. from Ohio Wesleyan in 1931, and from the University of Michigan, Duquesne University, Wayne University, Mt. Union College all in 1934, University of Southern California in 1935, University of Akron and University of Pittsburgh, 1948.

He held many governmental offices. Among them were chief, division of higher education, U. S. Bureau of Education, 1920–25. He was the president of the University of Akron, 1925–33; U. S. Commissioner of Education, 1933–34; president of the American Council on Education since 1934, and many other educational offices and assignments.

♦ MRS. VERNE C. FRYKLUND, wife of the president of The Stout Institute, Menomonie, Wis., died Saturday afternoon, September 8, 1951.

She was born at Coatesburg, Ill., but spent most of her life in Oklahoma and Arizona. She came to Menomonie in 1945 when Dr. Frykhund was made president of The Stout Institute.

♦ CARL TURNQUIST and ARTHUR ELGES planned an institute for graduates of auto-mechanics programs held at Cass Technical High School, at Detroit, Mich., during the week of June 25. This institute was underwritten by the Ford Motor Company. The program was conducted as an automotive service competition sponsored by the Detroit Ford dealers. Thirty young men participated.

♦ JOHN JARVIS made a slide film on job and trade analyses in connection with a series of visuals being produced by the National Association of Industrial Teacher Trainers. The film was produced in the visual department of The Stout Institute. Dr. Frykhund's book on job analyses is the basis for this slide film.

♦ URWIN ROWNTREE received a doctoral degree at the University of Pittsburgh in June of this year. His dissertation topic was "Guiding Principles of Vocational Industrial Related Instruction." He earned his B.S. degree at the Pennsylvania State College and the master's degree at the University of Pittsburgh. He was formerly chief of industrial education in the Pennsylvania Department of Public Instruction, professor of industrial education at the Pennsylvania State College, and his present position includes the direction of the vocational teacher education program in the Connecticut State Department of Education.

♦ JACOB SCHOEPPLER, formerly director of training at A. O. Smith in Milwaukee, Wis., has gone to Michigan State College as assistant professor of business administration.

♦ FRED SCHELTER was employed by the department of industrial teacher education at Wayne University, during the second semester 1950-51, to teach one of the basic shop courses.

♦ WILLIAM T. SARGENT, who is on the staff of the Northern Michigan College of Education, has been in full-time residence at Wayne University working on his doctorate. He has now completed the qualifying examinations and will be in Detroit for the first semester next year.

♦ ADRIAN POLLOCK has been named chairman of district 6, Michigan Industrial Education Society, for the fall regional meeting, which has been planned for early in October.

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Your entries will be judged by an impartial panel of outstanding shop instructors, administrators and architects.

At the close of the contest, best plans will be gathered into book form, as a service to school men throughout the world.

GROWING NEED FOR SCHOOL SHOPS

You know the amazing job done by America's school shops—for you have had a part in it. You know, too, what infinitely greater demands the future will make on America's schools. Plan now to take part in this vital contest—present your thinking on sound shop planning, and at the same time compete for these valuable Delta tool prizes.

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4. **Senior High School Shops—10th, 11th, 12th Grades.**
5. **Technical High School Shops—Trade Schools, Vocational, Continuation and Part-Time and Adult Education Schools.**
6. **Technical Institute Shops—high school post-graduate courses or 13th and 14th grades.**

You may submit an entry in any one or all of the six divisions.

CONTEST INSTRUCTIONS

a. **All entries are to be submitted on the official Delta Shop Floor Plans.**

b. **The true location of windows and doors must be indicated, as well as lumber and material storage area and tool room area. It is not necessary for such storage areas themselves to appear on the plan, but entrances to them must be clearly shown.**

c. **Entries may be submitted in as many divisions as desired, but each entry must be on a separate official floor plan, and must indicate clearly the division for which it is intended. In each case, the type of shop should be described (wood, metal, general, etc.).**

d. **A supplementary description *must* be submitted explaining why the various arrangements are made. In cases of similar layouts, this description will be the deciding factor in judging.**

e. **Supplementary drawings may be submitted showing bench design, cabinet types, tool panels, etc., only if they are sufficiently individual to influence better shop performance.**

f. **The layout should allow for an anticipated 25% to 50% expansion in student requirements. The shop of "today" should be shown on your floor plan No. 1; the "future" part of the shop should be clearly indicated on your floor plan No. 2.**

g. **Contestants must indicate whether or not the plan is original or existing (if it is an existing shop, it must have been designed by the entrant).**

CONTEST RULES

a. **Contest starts November 1, 1951.**

b. **The contest closes at midnight, July 31, 1952.**

c. **Prizes will be awarded concurrently with the AVA convention in Boston, November, 1952.**

d. **All entries become the property of the Delta Power Tool Division, Rockwell Mfg. Co., Milwaukee, Wisconsin.**

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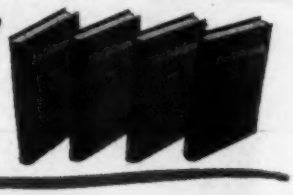

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- read Contest Rules
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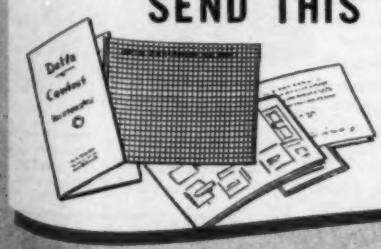
Who is eligible?

This contest is open to school men engaged in instruction, supervision or administration of Industrial Arts, Industrial and Vocational Education, and to graduate and under-graduate students at accredited teacher training colleges.

Not eligible are all persons employed by or in any way identified with the Rockwell Manufacturing Company — its divisions, its dealers and distributors, its advertising agencies, including all members of their families.



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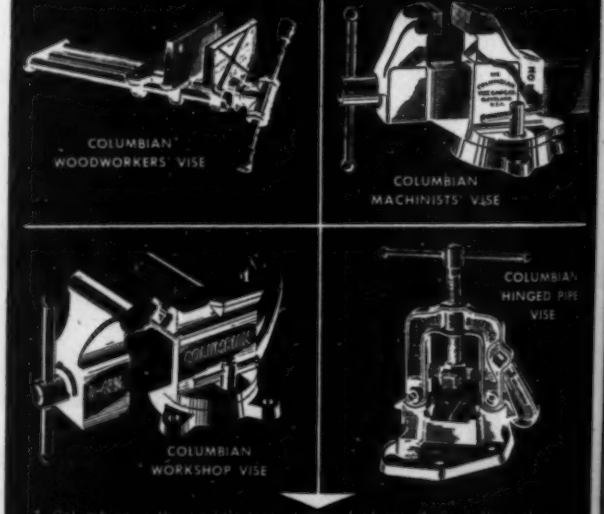

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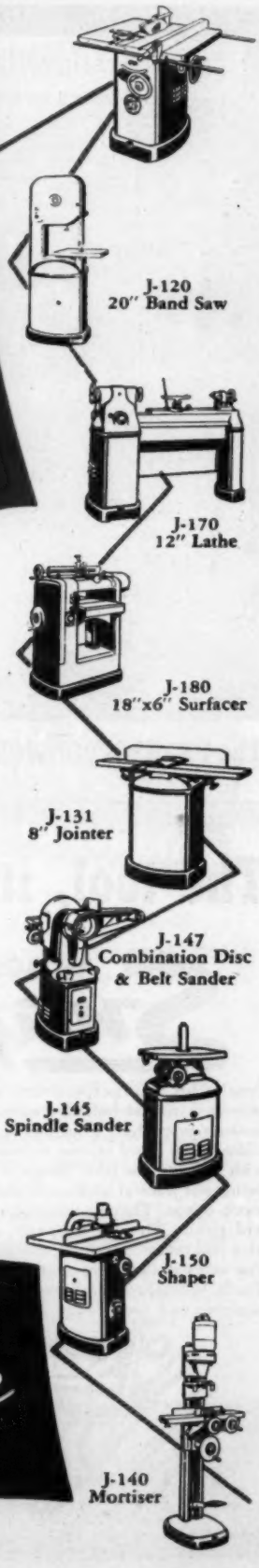

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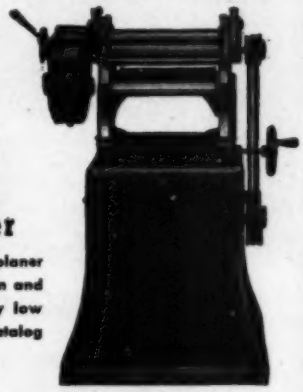

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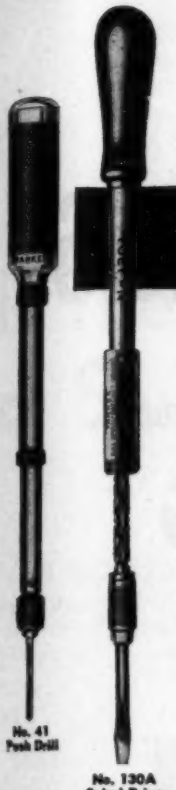

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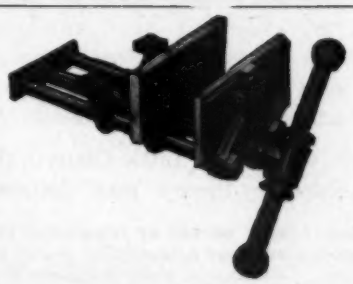

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INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

NOVEMBER 1951

Is There a Place for a State Course of Study in Industrial Arts?

IVAN HOSTETLER
Head, Department of Industrial Arts
North Carolina State College
Raleigh, N. C.

Effective teaching of industrial arts requires that goals be clearly established, the path for attaining them be outlined, and methods be found to determine the extent of their achievement. These are the functions of the curriculum and course of study. To be sure, a well-prepared course of study does not guarantee effective teaching, but it is a means through which good teaching is more likely to take place.

What Is a Course of Study

In a state publication[1] on curriculum problems, a course of study is described as follows: "A course of study is a manual to guide and assist the teacher in developing the curriculum and in making teaching more effective. . . . It represents little more than the barest outline of these knowledges, understandings, attitudes, skills, habits, and appreciations that should characterize the educated individual at the different levels of development."

A more traditional definition describes a course of study as a complete set of plans and specifications for doing a job of teaching a course at a given grade level. These definitions represent two different types of courses of study. The first seems broad and flexible, and one which is readily adaptable to almost any situation. One could hardly object to such a course of study which, if used intelligently, would undoubtedly make teaching more effective.

However, our problem is not whether we are for or against a course of study, but whether or not it should be developed and issued on a state level. This raises a question concerning our problem — Is there a place for a state course of study in industrial arts? The answer to this question may depend on what we mean by a course of study. To one it may mean one thing and to another something else.

The director of industrial arts and vocational education of a large city system confirms this in part when he says, "When the phrase course of study is used, I doubt if all people have the same notion or understanding concerning what it really is. If a course of study is a dictatorial step-by-step procedure for teaching certain projects, then the state should not release a course of study. On the other hand, if a course of study is conceived as a statement of broad general principles setting forth the basic philosophy and place of industrial arts in the general educational program, then the state has an obligation to produce such a document."

Let us examine the nature of the state bulletins of industrial arts which have been issued in the past.

William R. Anderson in a report[2] of his study made in 1947 on "State Syllabi in Industrial Arts" based on a careful review of 23 different state bulletins, gives the characteristics of the average state syllabus as follows:

"First chapter with general discussion of the curriculum area, ten objectives, superficial mention of method.

"Main body chapters consisting of the subject outlines for bench woodworking, electricity, mechanical drawing, auto mechanics, sheet metal, and home mechanics. Average for the 23 states was over seven subjects.

"Outlines consisting of three or four parts, such as things to do (manipulation), things to know (information), references, some suggested projects, a loose connection between the doing and knowing units of instruction.

"References consisting of a few books, suggested as texts or aids.

"A final chapter including equipment lists for varied types of shops, plus some suggested floor plans and arrangements of the kind useful in planning new work places."

We might point out that a careful study of state bulletins issued since Mr. Anderson's report shows a trend in the direction of broader curriculum guides.

In a survey[3] made of all the 48 states concerning state bulletins, Dr. Feirer found that there was a great deal of duplication in the various state industrial-arts bulletins which may be due to the fact that many states tried to adapt much of the material from the AVA bulletin.

[1] *A Study in Curriculum Problems of the North Carolina Public Schools*, State Superintendent of Public Instruction, Raleigh, N. C.

[2] Anderson, William R., "State Syllabi in Industrial Arts," INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, September and October, 1947.

[3] Feirer, John L., "State Publications in Industrial Arts," an unpublished report.

Twenty-five leaders of our profession from all parts of the country, representing two schools of thought in industrial-arts education, were asked to give their opinions on the question before us. Twenty-two responded and the majority of these believe that the State Department of Education should provide some material for the teachers, but only seven specifically favor a state course of study. All of these modified their statements by saying that these courses of study must be kept broad, flexible, up to date, and must be developed by the teachers under the guidance of the State Department. Some avoided the term "course of study," but spoke of state programs. The remaining fifteen favor general materials in the form of "curriculum guides" which they think will insure flexibility of programs on the local level in terms of individual needs, interests, and abilities of the youth and the community.

Comments by Representative Leaders

In presenting the two views on state courses of study, typical comments will be given by representative leaders from all parts of the country.

One teacher trainer in supporting a state course of study says, "Some may argue that courses of study have the effect of regimenting teachers and of stifling originality. Such arguments, it seems to me, are about as sound as contending that musicians could do better without the aid of printed music. Courses of study provide a base line to start from, and the well-trained teacher should use them with some imagination and resourcefulness."

A southern teacher educator says, "My attitude toward a state course of study is similar to my attitude toward socialized medicine, raising children, and income tax. All are necessary to our way of life. . . . I firmly believe in the value (of a state course of study); not a rigid course but a prescribed basic course with some allowance for the individual situation."

A state supervisor puts it this way, "It is my sincere conviction that State Departments should provide teachers with materials which can be used according to the needs of the local situation. When this is done, each teacher should be required to keep a record of the operations and processes performed by every pupil, the projects made by each pupil, and the lessons and demonstrations taught by the instructor.

"When this is done, the course of study serves as a road map which shows where the teacher is going and the records serve to show where the individual pupil has been. This results in a good course with some control but little restriction."

A well-known teacher trainer from the West says, "A state course of study may easily be a valuable document if its construction is flexible and the application judicious. I feel very definitely that it is quite possible to use a state course of study to the disadvantage of good teaching in the public schools of the state, but that it is also possible to use such a piece of work for the encouragement of good teaching.

"I would distinguish between a course of study and a guidebook or handbook, as published by a number of states."

The majority of the leaders feel that there is no place for a state course of study as such, but believe that curriculum materials produced by committees of teachers and edited by the State Departments would be very helpful.

One national leader expressed his views as follows: "Most enlightened leaders I have heard or read on the subject of courses of study now look upon curriculum improvement as basically a matter of human relations efforts calling upon pupils, teachers, administrators, parents, and other resource groups.

"This point of view does not imply that the State Departments of Education shouldn't publish materials. By all means, they should, but not the traditional lifeless courses of study."

Wesley Ketchum, State Supervisor from Connecticut, states his opinion as follows: "A state course of study in any area of elementary or secondary education implies a regimentation that has little or no place in the program of a modern school's activities. A state course of study in industrial arts is too often a job analysis approach to the content of shop subjects, and teachers required to use a course of study generally teach from rather rigid outlines of required subject matter. Such an approach allows little consideration for the individual differences of pupils and too often makes no attempt to adjust to the interests and abilities of the group."

Dr. John A. Whitesel, from Miami University, puts it this way, "Any course of study should be built around the solving of everyday problems of the youngsters. This immediately makes a cut-and-dried state course of study outlining specifically what pupils are to do throughout the year, not only undesirable, but impossible. For example, in woodworking, no course of study should determine ahead of time what projects the students are going to build, what joints they are going to make, or just what week they are going to learn to bore a hole. All such experiences should occur according to the needs in solving the pupil's problems that particular year or semester."

Dr. Silvius, of Wayne University, believes that "Courses of study need to be 'tailor made' by professionally trained teachers for each specific teaching situation. Every group of students is different, the teacher's preparation needs to be considered, such factors as the physical plant need to be reckoned with, as well as the mental ability and capacity of the students. For that reason, I believe that state courses of study or city-wide courses of study should be discontinued."

Stanley Pawelek says, "You will be amazed to learn, I am sure, that I would not go along with any course of study issued on a state-wide basis and to be used by the various teachers. In fact I do not even believe in a city-wide course of study as such, and if you would come to Baltimore, you would not find such an instrument anywhere in the schools."

A well-known teacher trainer expressed his opinions briefly as follows: "I shall have to say that I am quite opposed to anything that is labeled a 'state course of study.' After all we are teaching the arts rather than the sciences. I do not like dictation at the local level from a state office in the matter of the minute content details of all of the different courses in industrial arts at all grade levels, for all communities."

You have heard the opinions of industrial-arts leaders on this problem. Two-thirds of those who expressed opinions believe there is no place for a state course of study as such.

The Pros and Cons

Those who favor a state course of study give the following reasons for their support:

1. It helps beginning teachers to overcome the initial period of trial and error in setting up a program.
2. It helps the "old-timers" to bring their programs up to date.
3. It keeps all shop teachers abreast of the new thinking as regards curriculum.

4. It serves as a standard for the administrator in evaluating his program.

5. It helps the administrator in evaluating his teachers.

6. It helps the administrator in justifying a broad program of industrial arts to his board of education and to his community.

7. It guides teachers with limited training in setting up a broad program.

8. It is a guide in planning facilities (new and old) to accommodate a broad program.

9. It gives some assurance of uniform offerings.

10. It serves as a leverage for all concerned to meet the minimum standards set up by the State Departments of Education.

11. Teacher education institutions will use it as a guide.

Those who oppose a state course of study propose the following alternative materials and ideas to be issued on the state level:

1. A state bulletin containing a statement of philosophy and purposes of industrial arts.

2. A statement of guiding principles that should be followed in setting up and keeping up to date a modern program.

3. A curriculum guide developed by committees representing the best thinking of the teachers in the field.

4. The curriculum guides should insure flexibility of programs on the local level.

5. Certain general areas of industries should be recommended as a minimum.

6. It should recommend some organized source materials as references for study.

7. It should leave the actual teaching to the teacher.

8. Useful resource materials, preferably in loose-leaf form which teachers can adapt to their own needs.

9. Descriptions of good or unusual industrial-arts programs described from time to time as examples of good practices. But these should be written in such a manner that they could not be copied.

Conclusion

You have observed the different points of view expressed toward a state course of study. Some good arguments were presented in support of such a course. Some of our leaders favor a state course of study but want it kept broad, flexible, and adaptable to the needs of local communities. Others favor a course of study but not on a state level. Still others are opposed to a course of study on either state or local level.

It is the belief of the writer that all of the industrial-arts leaders and teachers want essentially the same thing concerning state materials, but do not identify it by the same name. Some call it a course of study, but in defining it they attach to it about the same meaning others call a curriculum guide. A narrow state course of study giving a step-by-step procedure for teaching certain courses and limiting the content to specific knowing and doing units of learning can hardly be justified in the light of modern education. Such a publication should be discouraged because when printed and issued by the state it suggests permanency and uniform fixed procedures which cannot be easily changed or easily adapted to the needs of all communities.

On the other hand, it is the writer's belief that states should issue a series of general bulletins in the form of curriculum guides (such as some of the more recent state bulletins) which may provide all of the advantages suggested by the proponents of state courses of study and yet be flexible enough to insure programs on the local level in terms of the individual needs, interests, and abilities of the learner and the community. Bulletins of this type that really tackle the problems of the community and the state would make a real contribution toward the development of good industrial arts programs and should, therefore, replace the traditional, lifeless state courses of study. This is our answer to the question raised concerning the place of a state course of study in industrial arts.

The Place of Craftsmanship in the Industrial-Arts Curriculum

BURL N. OSBURN
Director, Industrial Arts Education
State Teachers College
Millersville, Pa.

The teacher of industrial arts is intensely interested in tools and materials. He typically regards himself as a craftsman, and thinks of his work as that of passing on the skills of craftsmanship to his pupils.

It may be well to examine some of the meanings and implications of the idea of craftsmanship, that we might see its importance in the curriculum, and what some of its outcomes may be.

Craftsmanship has a long and noteworthy tradition in this country, and back of that are the standards and quality of the European guilds with their unsurpassed ideals of workmanship.

Handicrafts in the American Colonies

Handicrafts, in the American colonies, contributed to personal needs, the household, trade, and agriculture. The average colonial country household was a sort of self-sustaining unit which depended little upon the world beyond its own gates. Its equipment included facilities for preparing food, medicine, for making farm equipment, furniture, and many other indispensable items. The enterprising farmer

might have a loom house, where all the processes of producing cloth were carried out. Here were flax brakes, carding combs, hackles, reels, spinning wheels, and looms.

All of this meant a quality of independence that could withstand world events and political and economic changes. With such capacity for self-sustenance, economic upheavals were of relatively small importance. Stuard Chase estimates that as late as the end of the eighteenth century, 75 per cent of all services and goods consumed by a family living in or near a small New England village were derived from the household itself, another 20 per cent came from the village craftsman, while only about 5 per cent came from the outside world.

This economic independence probably contributed to a political independence which manifested itself in many ways, including national government. It made for family solidarity and gave responsibility and usefulness to every member.

As wealth and commercialism advanced many duties were turned over to the village craftsman or the itinerant tinkerer, so that many weavers, cordwainers, pewterers, tinsmiths, and others earned their living by these means. The village craftsman built his business on a custom-order market, for the most part, and his product was a "bespoken" one.

The Effect of the Factory System

Through all of this there ran a system of apprentice training, which at its best has been unequalled for effectiveness. Standards of fine quality of workmanship and a desire to make things beautiful, effective, and enduring were implanted in the apprentice, along with the skills he acquired.

Despite this vigorous condition which persisted well into the nineteenth century, the factory system, growing so strongly in England and the United States, began to displace the old handicraft methods. Particularly was that true in the textile industries, where we see the clearest development of the industrial revolution. Household industries were transferred to the factory, or remained in the home as a sweated industry. The allure of profits from the factory system was so strong that by the end of the war between the states little effort was made to compete with it. Old values created by tradition were rapidly undermined by the mechanistic sciences inherent in an industrial society.

Training of the learner shifted from the fine personal relationship of father and son, master and apprentice, to the purely economic system of foreman and operator, or other multiple and wholly random arrangements.

One might think as a result of these mighty changes that fine craftsmanship, with its standards of perfection, would be a thing completely of the past, so not worth discussing. For a large share of the population this is true. Not only is a smaller and smaller proportion of people earning a living by the exercise of a highly developed skill, but the consumer — the general population — has less and less regard for it, since it sees little and knows less of standards of fine workmanship.

With this change something fine has gone from the lives of most people — something which deserves to be preserved, if for no other reason than that craftsmanship is sympathetic with human nature.

Craftsmanship Not Entirely Lost

Despite the dominant and rapidly growing pattern of machine production there yet remains a vestige of the old spirit and ideals of craftsmanship.

1. Many kinds of work have never left the handicraft stage of economy; notably the building trades, although these are rapidly changing. The tool and die maker, and others carry on much as before. (It might be said, here, that in a machine age the finest traditions of craftsmanship remain in the making of tools and machines to make other machines.)

2. Some products require careful piloting through the planning and designing stages by handicraft methods before they are put into machine production (ceramics, textiles).

3. Through the craftsman many early arts are preserved, whose techniques and values would otherwise be lost. The interest aroused in recent years in folk arts of many kinds may simply be a refuge in a nostalgic yearning for the good old days, yet for many persons this serves as a field of wholesome interest, recreation, and research. Museums have extended their collections, while private individuals in great numbers gather and study every kind of article and process. Organizations such as the Early American Industries Association, Williamsburg, Storrowtown, and Old Sturbridge, Mass., and the seminars on American Culture at the Farmer's Museum in Cooperstown, foster active study and research as well as practice in these traditional arts. The legislatures of several states have passed laws providing for the encouragement and promotion of handicraft education and production on the adult level.

4. One of the most potent uses of craftsmanship today is the use made for health purposes. Even when used merely as a field of interest it has health values. It is necessary here only to point out the vast increase in the number and variety of home workshops as well as the uses made by recreational organizations, therapists, and others. One should note, too, that one of the most potent influences positively affecting personal health is the feeling of self-respect and the satisfactions of clearly visible accomplishment. These feelings are often denied the modern man if his interests are along constructive lines, for his job may not offer him the opportunity of gaining standing through his work, as it would have done in an earlier day.

5. For many people craftsmanship means a degree of financial aid. This may be as a supplement to subsistence living, such as is commonly practiced in the southern highlands, parts of New England, by some Indian tribes, and in other marginal areas.

To a large number it means making and having things that could not be purchased. The home workshop makes many a householder almost as independent in some respects as were his colonial ancestors. The day of the occasional independent craftsman who tries to live by his skill is not easy, for he must carry his full share of the general burdens, and pay his own way, as well as put into his work that surplus that means quality — all of this without the benefit of Smoot-Hawley tariffs, Chambers of Commerce, professional lobbyists, or other subsidies and stimulants.

6. The craftsman is blessed with being able to put something into gifts that money cannot buy. Increasing numbers of people are learning to appreciate fine workmanship, and to value such gifts.

7. The writer likes to think that the greatest value of craftsmanship is that it represents and practices a *qualitative*, rather than a *quantitative* way of life, a human, rather than a materialistic philosophy.

He is greatly disturbed by the failure of our planners and statesmen to deal successfully with our economic and political problems. Even more discouraging is the fact that nowhere is there an important voice raised to champion a solution of any of these by any but quantitative means. Solutions invariably take the form of providing for more and still more production. Quantity is essential, to be sure, but it alone has been and always will be inadequate. We have tried to correct our weaknesses by pursuing bright slogans: "the full dinner pail," "a chicken in every pot," "a car in every garage," "two cars in every garage," "buy more," "produce more," "more speed," "sixty million jobs," "export or perish," "the Marshall plan." These have been and are political expedients and stopgaps designed to stimulate a faltering economic system.

Quantity Not Quality

The quality of the goods produced under these plans is of little apparent concern to anyone, for it is not mentioned. The effect of the production system on our resources is not considered, and the effect of all this on the worker, himself, is not thought of.

It seems a matter of regret that no one argues that the goods produced should be useful, that they should actually be so needed by someone that advertising pressure would be unnecessary. No one proposes that they be beautiful, that they be honestly made to last as long as possible, that the materials be the best, and that claims made for them should be trustworthy.

No one contends that workers need the incentive of pride in accomplishment — pride that comes from doing better work in place of merely more work. (Improvability in most machine-tending jobs lies only in the direction of greater speed and uniformity. Quality generally is determined by the machine, itself, and after a relatively brief training, the worker can make no improvement except a quantitative one.) No consideration is given to the possibility that men who love their work would rather do it than loaf.

The writer is fully aware that all this sounds like the beliefs of an impracticable idealist, but it would be difficult to prove to him that there is anything particularly practical about the way things are going today. It must be remembered that change is rapid, and if we are to direct the changes we might try the goals of idealism — perhaps they actually are the realistic ones. No one knows how the goods of tomorrow will be produced. The effects of machine production are bringing a rapid depletion of our natural resources (William Vogt, *Road to Survival*). They bring commercial waste and strain, economic penetration of foreign countries, and war. They bring a population of men of maturity who, although at their best period, are not generally wanted in industry. They keep the worker at an inhuman, unnatural pace and rhythm in his work, which is often dull, repetitive, and unvarying.

Preserving the Social Values of Craftsmanship

Almost every important function and ideal of society eventually falls to the schools to perpetuate. Craftsmanship is no exception. There is little doubt that as an ideal and as a practical necessity it is of such social worth that it should be preserved. This is a function of all phases of education, but one for which the industrial arts are peculiarly adapted. What is needed to do this?

1. At the head of the list a teacher; himself a craftsman, who can demonstrate his skill with assurance and pride; one who knows much of how the world's goods are produced, is familiar with the finest and how they have been and are made. He should be one whose zeal for a qualitative standard is contagious. He should not be afraid of being original, since this is a necessary attribute of craftsmanship, and with this attitude must be able to lead others in work that will give increasing opportunity for creativity and an enlarged understanding.

He should not be afraid to take advantage of the co-operation that comes with genuine interest, on the part of the learner. He must hold to high standards, but always relative to the maturity and experience of the learner, and use those standards to encourage rather than to discourage him.

He should recognize and work on the principal that everyone *must* achieve self-respect, and that this may come to some through successful craftsmanship. He should be able to think — to design — to teach others to do the same. This ability requires the same kind of study and practice as does his skill with tools.

2. Next, is the requirement for adequate professional conditions.

a) No teacher can successfully achieve such goals as have been here described in an hour or two per week, nor with oversize classes, nor inadequate time for preparation and maintenance. This poses something of a dilemma, since it is difficult to achieve good results without adequate time, yet it is equally improbable that the administrator will allow more time unless he can be assured of results.

b) The physical plant must be planned to meet a broad range of interests. The day has passed when the traditional woodshop, originally designed to implement the abandoned belief in faculty psychology, can meet the interests and needs of today's young people. Whether a school provides a single general shop, or several generalized unit shops, may be a purely administrative matter on the local level, but there is no longer any excuse for the kind of system set up according to the programs of Calvin Woodward or Otto Salomon.

c) The industrial-arts teacher is too often a rank materialist who is more interested in how something works than he is concerned about the social effects of that work. Scientists are — rather belatedly — beginning to be concerned about the ef-

Arts and crafts work made by students of Tucson Senior High School, Tucson, Ariz. Submitted by Harry A. Goldstein, instructor of photography

— Photograph by Ken Kemmerles

fects of their discoveries, and, although the teacher's impact is not as impressive or as violent, he cannot escape the responsibility for his viewpoints and acts, particularly as they affect young people. A teacher must see beyond the purely mechanical.

d) Many teachers have little or no idea of design — a first essential of true craftsmanship — and are content with good tool work, often used in the execution of articles that could have no possible place in anyone's life (broom holders when there is no broom). To teach craftsmanship means to teach the attainment of beauty, which is not the fleeting, vague, intangible factor it is so often thought to be, but the very essence of practicality, perfection of function, and honesty in material and production.

While this article tries to picture craftsmanship as a desirable feature of the curriculum, it must be made very clear that it cannot be an end in itself. The writer is not at all concerned that everyone should learn to use certain tools; no one has yet proved the necessity for that, nor convinced educators or the public generally. He does believe, however, that much of our program can be based on craftsmanship as a means to very desirable ends.

Through it the learner may come to appreciate the cultural heritage by gaining an understanding of and a measure of control over the man-made physical world. He also owes it to himself to explore the varied fields of worthy human endeavor to discover wherein each may increase the richness of his life, and through which he, in turn, may make a contribution.

Not everyone will find the qualitative life in craftsmanship, for some that will come through music, gardening, homemaking and other value-giving ways of living. Yet for many boys and girls, men and women, the enduring satisfactions may come from the experiences begun in the school shop — experiences that bring them a lifetime of pleasure and growth. We can do no less than to offer the best opportunity we can produce to make these experiences effective.

Leaders in Industrial Education

WILLIAM T. BAWDEN
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(*Continued from page 315 of the October, 1951, issue*)

FRANK MITCHELL LEAVITT

For the second time in this series I am writing about the career of a man who is still living, although he retired from active duty more than 16 years ago. He began teaching in one of our largest cities in the fall of 1887, while I was entering the seventh grade of a small-town elementary school. He began to attract much more than local, if not nationwide, attention to his leadership qualities less than ten years later, at about the time I was being graduated from college.

For several days I have been leisurely assembling the data preparatory to writing this sketch, and have been going over in my mind from time to time the form it is to take and the successive topics that are to receive consideration. It is a stirring experience, this attempt to invoke the memories of 20, 30, 40 or more years ago, and to reconstruct events and circumstances, some of which stand out more or less vividly even today because of their importance at the time, but some of which have become dimmed with the passage of the years, possibly because I was not observant enough to realize their importance at the time.

With each sketch in this series I have found real pleasure and satisfaction in recording for permanent preservation something of the achievements and especially the personality of one individual after another whom I have looked up to as a leader, whose accomplishments I have admired, whose opinions and judgments I have highly esteemed, and whose friendship I have cherished for so many years.

The subject of this sketch deserves a prominent place in this collection of leaders for four reasons primarily, which could be supported by other weighty considerations if time and space permitted:

1. His service for 18 years as the guiding spirit in the program of manual training (later industrial arts) in the public schools of Boston.
2. His term of eight years as associate professor of industrial education in the University of Chicago.
3. His achievements during 18 years as associate superintendent of public schools in Pittsburgh.
4. His authorship of two timely books that had a profound influence on the development of the movement for industrial education.

The Beginning

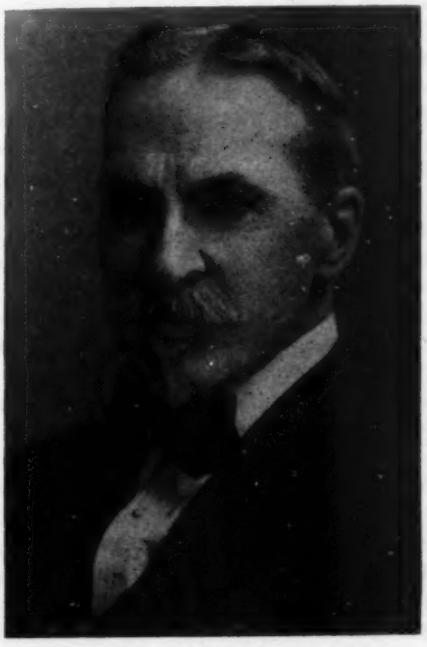
Frank Mitchell Leavitt was born in Boston, Mass., on September 20, 1865; and since his retirement from active duty in 1936 he has made his home in St. Petersburg, Florida.

He was a student at Massachusetts Institute of Technology, 1886–87; at Harvard University, 1891–93; and at the Sloyd Larar Seminarium in Nääs, Sweden, 1894–95.

He began teaching as assistant instructor of carpentry at Massachusetts Institute of Technology, 1887–88, and as instructor

of machine-shop practice and mechanical drafting, 1888–89. In the fall of 1889, he was employed to teach manual training in the Eliot School, Jamaica Plain.

This school was endowed in 1690 by the Apostle John Eliot who, in addition to his duties as pastor of the First Church in Roxbury, now a part of Boston, preached to and taught the Indians and Negroes. Before his death he gave to Boston all his property, most of which was land in what is now Jamaica Plain,



Frank Mitchell Leavitt

and included the school, with the agreement that it should be devoted to the education of Indians and Negroes. When Leavitt came upon the scene there were no Indians, and Boston had long since abolished any color line in the schools. Consequently, for a long time the trustees who were charged with the administration of the property, could find no suitable substitute for the original purpose of the school.[1]

In the late 1880's, the trustees became interested in the proposal to introduce shopwork into the public schools, and they engaged Leavitt to plan the equipment for the Eliot School and to teach the classes. He was not given a specific title, but he was practically the principal of the school, in addition to other duties, from 1889 until he left Boston in 1910. The shop at the Eliot School provided instruction in manual training two hours a week to classes of boys in the seventh grade in seven schools located in Roxbury, Jamaica Plain, and West Roxbury.

For two years, 1890–92, Leavitt also taught in other Boston schools, and then was appointed principal of manual training schools. After 14 years as principal of manual training schools, 1892–1906, he was appointed assistant director of drawing and manual training, which position involved administration of the work, and in which he remained for four years, 1906–10.

[1]Details supplied by a letter received from Mr Leavitt, August 21, 1951.

He then served for eight years, 1910–18, as associate professor of industrial education in the University of Chicago. In the fall of 1918 he was appointed associate superintendent of schools in Pittsburgh, Pa., where he remained for 18 years, retiring from active duty in 1936.

In addition to his regular duties as outlined, he was a frequent contributor to technical and professional journals, and was author of two books to be discussed later. He was active in professional organizations of educators. For a number of years he conducted extension classes for teachers in connection with the University of Pittsburgh, Pennsylvania State College, and Carnegie Institute of Technology. He also was guest professor in the summer sessions at the University of Oklahoma, University of Wisconsin, Pennsylvania State College, State Teachers College of Buffalo, N. Y., and Haris Teachers College, St. Louis, Mo.

Personal Contacts

Although we had exchanged considerable correspondence before that date, our first meeting was at the convention of the Illinois Manual Arts Association in the spring of 1911, following his appointment to the faculty of the University of Chicago. A meeting that stands out more clearly in my memory occurred in Cincinnati, in May, 1912, in connection with the convention of the Western Arts Association. An informal meeting of members of the Manual Arts Conference was called, and we spent an afternoon in the discussion of problems related to the preparation of teachers of shopwork and drafting, and later we had dinner together.

For the ensuing 24 years we met regularly at least two or three times each year at educational conventions, and in addition I visited him in Pittsburgh on three different occasions. Among the most fruitful of these opportunities were the meetings of the Manual Arts Conference of the Mississippi Valley, which usually included from 25 to 30 men meeting around a conference table for two and a half days of almost continuous sessions.

I remember very well a visit in Pittsburgh, in 1934 I think, where I stopped over for a day on my way to a speaking engagement. Mr. Leavitt took me in his car, and we spent the better part of the day in visiting schools.

On our way from one school to another, I remarked that I had recently been asked to help on the program of graduate studies for teachers of industrial arts at Kansas State Teachers College, and asked him to tell me something of his experience with new teachers as they came into the Pittsburgh schools. What were some of the difficulties involved in getting a new teacher started? What were some of the weak points observed in the teachers' preparation which the teachers college should be trying to strengthen?

Orientation

Without hesitation Leavitt replied that there were two things that he found it necessary to do for new teachers who came to the shops and drafting rooms of the Pittsburgh schools without previous experience in a large city.

First, in a school system as large as that of Pittsburgh a considerable amount of organization, even regimentation, is unavoidable. To get things done there must be prescribed procedures and accepted ways of doing things. The maintenance of expensive

equipments and the handling of huge quantities of materials, tools, and supplies, as well as dealings with thousands of children and hundreds of teachers, require the almost endless details of memoranda, bulletins, and instructions from the central office, requisitions, purchase orders, invoices, inventories, periodical reports, and permanent records.

Mr. Leavitt observed that his first responsibility to a new teacher was to assist him in finding his place in this huge system, to instruct him as to just what was expected of him, and to assist him in meeting the varied requirements of his new assignment. He agreed that the teachers college can contribute very little directly to meeting this situation, especially since conditions necessarily vary widely from city to city. He recognized the problem as one inherent in the big city setup, and cheerfully accepted its solution as one of his major responsibilities.

The Quality of Good Teaching

With reference to the second problem he was of the opinion that the teacher-training institution can and should do something more than is usually done. He said, "The second thing I so often find it necessary to do for a new teacher coming into the system is to develop the concept of what good teaching is. I believe the teachers colleges can do more to help on this than they have in the past."

To illustrate the point, he related the story of his visit to one of the early industrial schools, many years before. It was about 1909 or 1910, when the industrial education movement was in its infancy. A certain industrial school, which I need not identify, was getting a good deal of favorable, not to say flattering, publicity. Visitors were spreading glowing stories about the equipment, the course of study, the instructors, the methods, and the accomplishments of the school, which was one of the earliest of the publicly supported industrial schools, and at that time probably in its second or third year.

In the spring, near the close of the school year, talking things over one day with his assistant and later successor as director of industrial arts, John C. Brodhead, they decided to take a day off, got on a train, and went out to visit this industrial school. They found a number of commendable and creditable features, and were able to carry home some helpful suggestions; but the point of Leavitt's story was what they observed in one of the shops, in which the boys were spending three hours each day, in addition to three hours daily in academic studies.

What the two men found was a very untidy and unkempt room that bore little resemblance to a school, but suggested rather the local run-down repair shop in which the instructor had been employed before he was transformed into a *teacher* by being catapulted into this job. The industrial-arts teacher of today who takes his boys to visit a modern industrial establishment — automobile assembly plant, electric generating station, printing plant, soap factory, biscuit factory — would have difficulty in imagining the appearance of the interior of a small-town carpenter shop, or machine shop, or cobbler's shop of 40 years ago. In this school shop the instructor went about his duties, with a huge quid of tobacco in one side of his face, expectorating here and there in the accumulations of refuse and debris on the floor, and sprinkling his instructions with ungrammatical expressions, mispronounced words, and occasionally with vulgar or even profane expletives.

The two visitors, with practiced eyes such as some of the earlier visitors did not possess, observed certain features which were not fully set forth in the published reports. In conversation about the work going on in the shop, the instructor pointed out with pride what the boys had accomplished. The boys had been putting in only three hours a day, five days a week, since September (a little less than nine months), only a little more than one half the time that would be put in by an apprentice in a full year; and yet these boys were already as far along as the average apprentice would be at the end of his first year!

The two visitors asked some searching questions, observed carefully the operations in progress, and formed as accurate an estimate as possible of the work accomplished during the year about to close. Upon comparing notes later it was agreed that the average boy in a beginning shop class in the same subject in a good public school industrial-arts department, giving only three hours a week to the work, was expected to be as far along by the Thanksgiving vacation in November as these industrial-school boys were in late May! And the difference was accounted for almost completely by the difference in the kind and especially the quality of the teaching.

The teacher in the industrial school had probably never been in school himself beyond the eighth grade, and certainly had never enrolled in a teacher-training institution of any kind. He had no other basis for judging the accomplishments and the progress of his boys except his own experience as an apprentice. Any method of learning that progressed more rapidly than the old-time apprenticeship was, for him, progress, improvement!

Teaching methods and personnel have changed radically in industrial schools as well as elsewhere during the past 40 years, and it is very unlikely that so striking a contrast could be found anywhere today. However that may be, the point that Mr. Leavitt made is a valid one, anywhere, and at any time; namely, that one of the most important responsibilities of the supervisor in any school system, as well as of the director of practice teaching in the teacher-training institution, is to develop in teachers, and especially in prospective teachers in training, the concept of what constitutes good teaching.

Admittedly it is a difficult thing to accomplish, but few things are more important in the preparation and make-up of a teacher. Of all places, the student in the teacher-training institution should come under the influence and inspiration of good teaching during his period of preparation for his lifework. And every young teacher should begin his career with high ideals of what good teaching is, to which to aspire. The more specific and the more objective these ideals and these concepts can be made, the better.

The City Supervisor

Before his appointment, in 1892, as principal of manual training schools in Boston, Leavitt had acquired five years of experience as instructor of shopwork and drafting at Massachusetts Institute of Technology and in the Boston city schools. The titles, principal of manual training schools, which he held for 14 years, and assistant director of manual training, which he held for four years, require some explanation, for they do not fully reflect the

nature and extent of his duties. In any other city he would have been designated supervisor or director. The fact is that during this period of 18 years, 1892–1910, he was responsible for planning, organizing, and directing the program of manual training in the public schools of Boston. It was a pioneering, creative, and highly creditable accomplishment. At that period very few cities of 200,000 population and over had undertaken programs of manual training (industrial arts) so comprehensive, so complete, and so progressive.

An American System of Manual Training

Mr. Bennett pays tribute to the creative work done by Mr. Leavitt during his period of service in the Boston schools.[2] Under the general direction of Edwin P. Seaver, then superintendent of schools, a series of experiments was carried on by three skilled teachers of markedly different preparation and background, but having common interest in problems of handwork instruction for boys of the seventh, eighth, and ninth grades. The three teachers were:

1. Frank M. Leavitt, teacher of manual training in the Eliot School, Jamaica Plain, at the time the experiments began. He had been a student at Massachusetts Institute of Technology, and in his training and point of view he reflected the methods of the Russian system of carefully analyzed and graded tool exercises.

2. Gustaf Larsson, a graduate of the Technical School of Stockholm, and a student of Otto Salomon at Nääs, Sweden. He came to Boston in 1888, and established a school for the training of teachers of Swedish sloyd. At the time of these experiments he was also teaching classes of boys at the Rice School, a public elementary school. One of the features of the Swedish sloyd was a fairly rigid series of *models*, and tool exercises so arranged and taught as to result in the making of *useful articles* in sharp contrast with the *exercises* of the Russian system.

3. Benjamin F. Eddy was an expert cabinetmaker, and was not the product of any formal teacher-training institution. He received his training in industry, and reflected the methods and standards of the skilled craftsman. Eddy was recognized as a *strong teacher* by those who knew his work, and at the time of the experiments he was teaching at the North Bennet Street Industrial School, where he gave lessons in woodwork to boys from two large public schools located in that district.

It should be recalled that one of the important distinctions between the Swedish sloyd and the Russian exercise methods was that the former required individual instruction, whereas the latter emphasized class instruction. Mr. Larsson insisted that sloyd could not be taught to large classes, because of the very nature of the work, and during the early period classes were strictly limited to 12 pupils.

On the other hand, the Russian system was developed originally to take advantage of the economies of large classes. When Leavitt introduced the work in the Eliot School, he equipped the shop with thirty workbenches, with all the tools on each bench that were needed for the work contemplated. In concluding arrangements with the principals of the schools which were to send pupils to his shop, Leavitt agreed to take "half of the then large Boston classes of sixty pupils each." It should be obvious why these large classes were much preferred by the regular teachers, because the regular work of the schools was interrupted much less, and much less frequently, than was the case when small classes of 12 pupils were demanded for the instruction in sloyd. It is also easy to comprehend the necessity for emphasis on class methods of instruction, with classes of thirty pupils.

During a period of approximately five years, 1890–95, these three men worked independently on problems of course of study, teaching methods, and equipment. In the words of Superintendent Seaver, the experiments were conducted "in expectation that there may be a clear demonstration from experience" as to the most desirable and most effective methods of conducting the manual training classes in these grades, "whether by the Russian shopwork or by the Swedish sloyd, or by some combination and outgrowth of the two, larger and better than either." The significance of these experiments appears in Mr. Bennett's observation that they "produced the typical system for the grammar grades of the nation."

Exhibits of the work from these three schools were sent to the World's Columbian Exposition in Chicago, in 1893, where they "attracted much attention and received general commendation. They were studied in detail by many schoolmen and special teachers of manual training. To many visitors, they were so nearly alike that they appeared to be essentially one system, with small useful objects as the chief characteristic. The effect was almost immediate. It was recognized that by accepting some of the so-called principles of the Swedish sloyd, while continuing to apply some fundamental practices of the Russian system, and harmonizing these with the best American practice in the use of woodworking tools, Boston had produced an American system of manual training that was pedagogically sound and practical."

(To be continued)

Browsing table keeps students posted on the latest trends in the plastics industry. Submitted by Alvin R. Lappin, graduate student, Wayne University, Detroit, Mich.

[2] Charles A. Bennett, *History of Manual and Industrial Education, 1870 to 1917* (Peoria, Ill.: The Manual Arts Press, 1937), pp. 432–435.

Industrial Arts and Vocational Education

John J. Metz, *Editor*

PRACTICAL WORK FOR OUR STUDENTS

October and November are some of our most beautiful fall months. Yet they also are the forerunners of winter, especially in the northern states, and that should remind us of chores about the home that ought to be taken care of before it is too late.

These chores present the shop teacher with an excellent opportunity to give his students firsthand experiences in doing practical home mechanics jobs.

Probably the first thing to take up with the class is the subject of checking up the heating equipment. This may present an interesting problem because the various members of the class may list a number of different types of heating equipment, ranging all the way from the ordinary wood or coal heater to a modern oil or gas unit.

It may be well for the teacher to equip himself with illustrative material to give his students a clear idea about how the various types of heating units and fuels work.

Heating a house has much to do with the method used to prevent the heat from escaping up the chimney or through the windows, doors, and walls of the house itself. Some of the students may know about these various heat losses.

Fuel dealers also may be interested in coming to the school to give the pupils a talk on the economical use of coal, oil, and gas in heating a dwelling.

The teacher may also help his students in pointing out to them how to make a checkup on heat losses through the heating unit itself, and through the windows, doors, and walls of their homes. Methods of correcting any faults that may exist also should be discussed. Since many of the students nowadays live in rented apartments it may be possible to team up some of these students with others whose parents own their own dwelling to make a co-operative job in which one or more students may join in learning a very worth-while home mechanics lesson.

Next come the storm windows. Usually some of them need to be reglazed, puttied, or repainted. Jobs like that had better be taken care of while the weather is still moderate. And then when the windows have been put into good condition, see that they are hung before the sharp winds of early winter make the job both disagreeable and dangerous.

Next check up on the gutters and conductors. A littered-up gutter aided by fall rains and alternate thawing and freezing may cause a repair job that will cost a sizable sum of money. Then, too, remember that hose which may still be lying in some secluded corner under a bush on the lawn.

The lawn needs to be looked after, too. Tree leaves should be swept up, and when they are burned on the property, take every precaution that the house is not set on fire. Before you touch a match to the leaves put them in a wire rubbish burner. Have water, a rake, and a broom handy just in case the fire should get out of control. Never burn up rubbish when a strong wind is blowing.

Do not neglect the interior of the house when preparing for winter. Check all of the rooms in order to minimize damages that may be caused by fire, wind, water, etc.

The type of precautionary work just described will prepare your students to become more thoughtful about the responsibilities which they will have to assume as they grow older. It prepares them for the time when they have families of their own.

THE A.V.A. CONVENTION

The 1951 AVA convention is a very important affair especially since the time span between World War II and World War III may be much shorter than the one between the two that we thought would allow the world to settle down for a real peace because future world wars would no longer be condoned.

"What fools these mortals be." Peace has not yet been established after World War II, and already bloody battles are being fought between those who had been allies before.

Again our country is in the throes of a wartime emergency. Many factories are working overtime, somewhat belatedly as usual, to prepare our country for the fighting. Administrators, directors, supervisors, and teachers of vocational education and industrial-arts education cannot overlook the fact that all this has a tremendous significance for their particular fields in education. Just how to meet the emergency has been sketched out for industry and the schools in the last war. Now we have to improve on the methods used then, because we are confronted by an enemy who not only knows all our secrets, but who is armed with weapons furnished by us.

Under these conditions everyone who can possibly attend the A.V.A. convention should be at Minneapolis on November 27, 28, 29, and 30, to assist in planning how best to carry on our work in preparing the youth of America for their life in a country that seemingly has been turned into a huge armed camp.

TEACHING THE YOUNG TO BE THRIFTY

In this age of unrest there are many adults who speak slightingly of saving money for the future. Unfortunately, the grueling days of the depression years of the 30's have given many people the idea that thrifty living need no longer be practiced. Their philosophy is simple — if you have saved nothing by the time hard times come around again, you will have less trouble in getting aid from the proper authorities. With this faulty notion in mind, these people live gay and happy lives not caring about the morrow, while their more cautious brethren save and invest their money, pay higher taxes, and when the time comes pay still higher local taxes so that the improvident may live.

Can we train our students to practice thrift again, as our forefathers practiced it? It is really worth a trial, but it will be uphill work because the parents of the pupils whom we will try to convert to the habits of thrift may not be thrifty themselves. They may belittle the old-fashioned ideas that the teachers are trying to inculcate.

In spite of this obstacle it is worth a trial, and probably the seed we sow may sprout and teach a lesson to our free-handed government that is spending the taxpayers' money so lavishly, and who can say — it may make Americans once more self-sufficient and independent.

Teaching General Shop Work

ALAN R. PAWELEK
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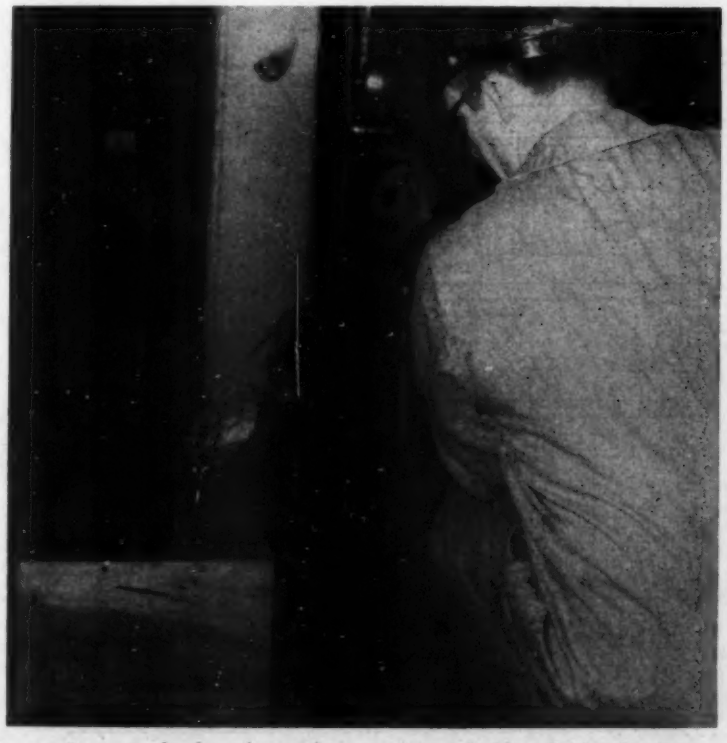
According to Dr. John R. Ludington, Specialist for Industrial Arts, U. S. Office of Education,[1] "there are more general shop courses taught in the United States today than all the other industrial-arts courses combined." If we accept this statement, a probable analysis of the methodology used in industrial-arts teacher education is in order. Although there are exceptions, no doubt, the typical teacher-education institution trains its industrial-arts majors in unit shops even though statistics indicate that the majority of the graduates will accept general shop positions. Are we educating our graduates for positions that exist for only the few? Seemingly, a parallel can be drawn with a situation where all high school students are on a college preparation curriculum.

With the realization that a possible injustice is being done to embryonic teachers, our staff is spending countless hours upon a revision of the industrial-arts curriculum. The collective thinking is crystallized upon, among other things, more experiences for the student in the general shop. At the present time the general shop course, consisting of skills and teaching techniques, is being required at the very beginning of the industrial-arts curriculum. After completing this term, the students' training will continue in the five unit areas. Then, the last phase of his laboratory experiences will consist of an attempt to integrate his previously learned skills and knowledges again in the general shop. The thinking is that the terminal course will serve as a nucleus to which he may attach his peripheral, unit shop experiences.

Two principal advantages seem to be inherent in this plan: a realization of the meaning of industrial arts in the initial term, and, secondly, a summarization of experiences and techniques in the concluding course. It must be realized, however, that the above plan is experimental in nature. After it has been in operation for a few years and subsequent refinements are made, we will be able to tell more about its advantages or disadvantages.

At the present time there exist two organizational plans for the teaching of the general shop. From the pedagogical point of view, for lack of better terminology, let us call the first plan the *station* or *rotating* type. The laboratory is divided into *stations* such as woods, drawing, bench metal, electricity, and printing. The number and quality of the areas are dependent upon the availability of equipment and the interests of the instructor. The class is divided fairly equally among the various stations and certain projects are assigned. After a student has satisfied the teacher that he has learned certain prescribed related materials and skills, he is moved into another area. It is assumed that another pupil, at approximately the same time, has finished a task and his subsequent relegation to the next learning area has taken place.

The preceding arrangement makes for an *orderly* shop, if the term is used loosely, and a fine laboratory atmosphere from the now obsolete dictatorial viewpoint. Each boy is presumably at a certain spot in the room, is busy, and always knows what to do next. He is competing with his project against his colleagues, against time, and for the nod of approval from



Scene in the foundry at the open house held on high school day, April 19, 1951, at the North Carolina State College, Raleigh, N. C. Submitted by Warren L. Carter, graduate student

[1] In an address delivered at French Lick, Ind., to the Indiana Industrial Education Association, March 30, 1951.

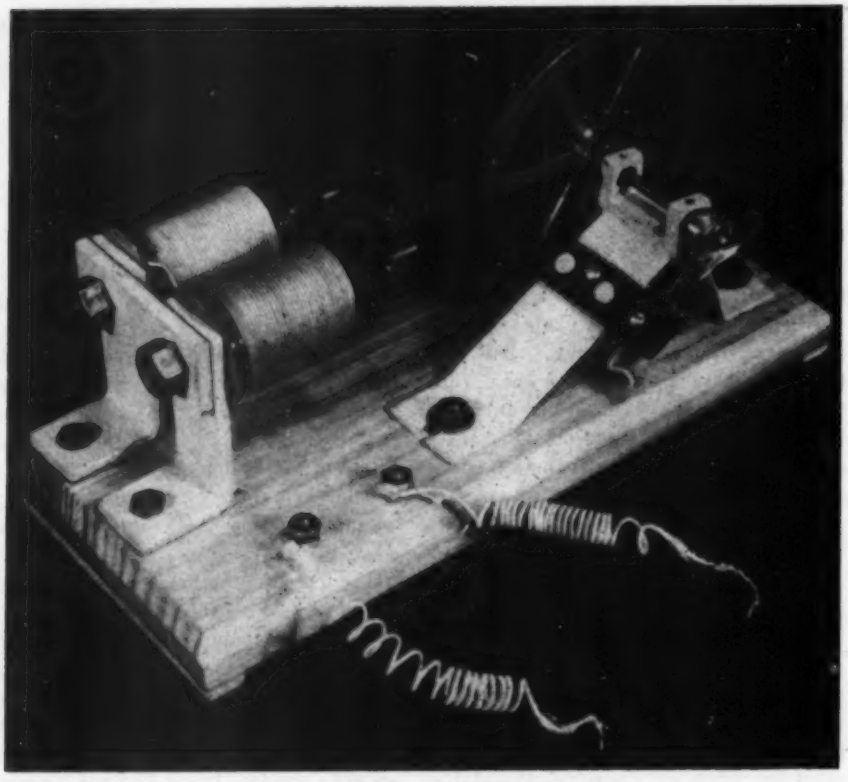
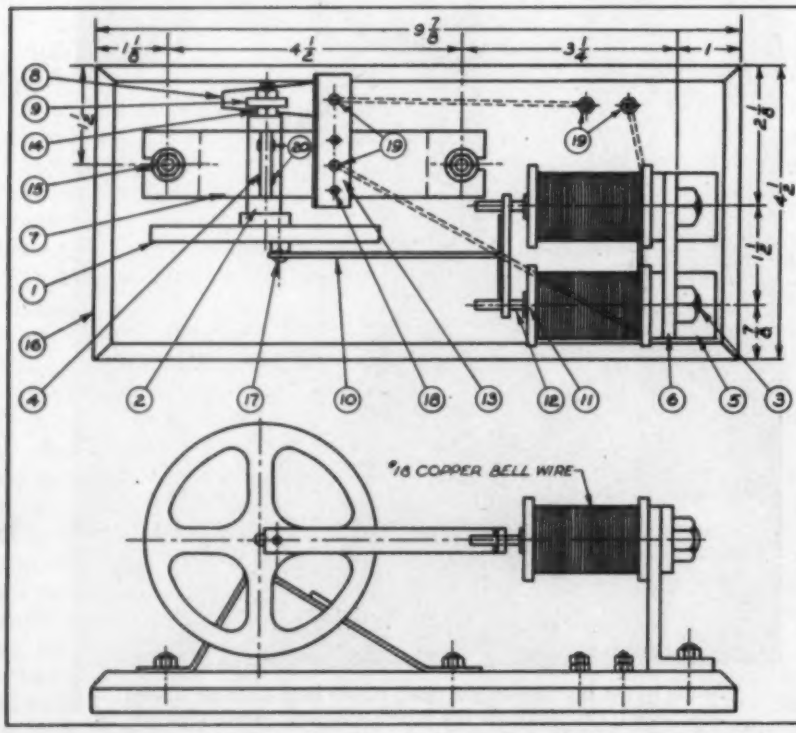


Fig. 1. The motor assembled

his instructor. The motivation, if any, is that of finishing ahead of his fellows and thereby earning the privilege of moving to another station. Unfortunately, with all of its so-called advantages, the emphasis is usually upon the wrong things and any motivation is negative in character.

The second organizational plan for teaching the general shop may be designated as *student interest-centered*. Again it shall be necessary to deal with the comprehensive general shop with its multiple areas. The teaching method in this plan implies initial demonstrations of the basic tools and processes in all areas. Sample projects may be exhibited for the purpose of motivation. After this beginning, the pupil plans an undertaking in one area and, after some suggestions from the teacher, goes to work on some job. Unfortunately, again, if success is met working with one material, the boy or girl will wish to continue in that medium. Because of the *student interest* philosophy, the instructor cannot and should not *insist* upon change. He can, however, through guidance and some direction, make the pupil *want* to attempt other media. Often, this procedure resolves itself into a difficult chore and taxes the in-



BILL OF MATERIAL

NO.	NAME OF PART	PCS. REQ.	MATERIAL	REMARKS
1	FLYWHEEL	1	LEAD	
2	BEARING	1	LEAD	
3	COIL CORE	2	M. IRON	$\frac{3}{8}$-16 N.C. HEX NUT
4	AXLE	1	STEEL	
5	BRACKET	2	M. IRON	
6	TIE PIECE	1	M. IRON	
7	SUPPORT	1	M. IRON	
8	CONTACT ARM	1	SPR. BRASS	20-22 GAUGE
9	CONTACT CAM	1	BRASS	
10	CONNECTING ROD	1	SHEET ST. & IRON	
11	COIL WASHER	4	WOOD FIB.	
12	CONNECT'G ROD SLIDE	2	BRASS	
13	CONTACT-ARM SUPPORT	1	WOOD FIB.	
14	HEX. NUT	2	BRASS	#10-24 N.C.
15	BOLT, NUT, & WASHER	4	BRASS	$\frac{1}{8}$ D. x $\frac{3}{4}$ LONG
16	BASE	1	WOOD	$\frac{5}{8}$ x 4$\frac{1}{2}$ x 9$\frac{7}{8}$
17	BOLT & NUT	1	BRASS	#5-40 N.C. $\frac{5}{8}$ LONG
18	RIVET	2	ALUMINUM	$\frac{1}{8}$ x $\frac{1}{16}$ LONG
19	BOLT & 2 NUTS	4	BRASS	$\frac{1}{8}$ D. x 1" LONG
20	BOLT & NUT	2	BRASS	#5-40 N.C. $\frac{5}{8}$ LONG

Fig. 2. Assembly drawing of motor

genuity of even the exceptionally strong teacher. Much too frequently the problem of continuous motivation becomes burdensome, and the learner is given *carte blanche* to follow his interest. This is the easy way out.

One cannot censure this type of instruction too severely as the values lie in the individual involved — the student. In some instances the methodology should not be considered suspect as in the case of the youngster who has found his niche and wants to continue therein. It is also quite possible that the pupil has already had an opportunity to sample other areas and does not care for the samples. Witness the boy who is intensely interested in photography. Must we tear him loose and insist upon his completing other tasks? Must we make him and ourselves unhappy by forceful direction? Is this good learning? or teaching?

In the above two examples can be found positive and negative guidance. Both are accepted in the philosophy of industrial-arts education with neither assuming a superior role over the other. The illustrative cases may be somewhat isolated but they do occur and cognizance of them should be taken. The implied techniques of treatment are certainly not opposed to any principle of educational psychology. There is one inherent danger which may eventually arise. If an instructor becomes lax in allowing his charges to follow their stated interests at all times, his laboratory will soon become a playground for the insincere. This form of degradation is certainly not implied in the objectives of industrial-arts education.

Because of the disadvantages to the pupils in the two methods of teaching general shop, it seemed well to search for another technique. From the psychological standpoint, but with certain qualifications, the learning process in both is that of the *part method*. Although there is much disagreement among our academic friends as to the relative efficacy of the *whole* versus the *part* methods, the tendency is to favor the former. In certain performances which involve a much larger scope of endeavor the *whole-part* technique is in favor. From this cue a new plan was partially developed which seemed to have possibilities, but no definite action was taken. Then, one day, a student brought a motor, Figure 1, into the laboratory with the idea of reproducing it. It caught the fancy of the group because of its uniqueness and the number of materials it incorporated into its construction. The designer[2] was contacted and permission was received to use his product in any desirable manner. Thus, a partial answer was found to the question of how the majority of industrial-arts areas could be integrated into one unit. In order to make the motor the following materials or substitutes must be used: copper wire, brass, paper, band iron, brass nuts and bolts, rivets, copper, fiber, wood, steel nuts and bolts, babbitt, solder. Besides these media the following useful processes would necessarily be experienced in order to fabricate the unit: molding, wrought iron work,

[2]Martin Davis, Industrial Arts Instructor, Daleville Public Schools, Daleville, Ind.

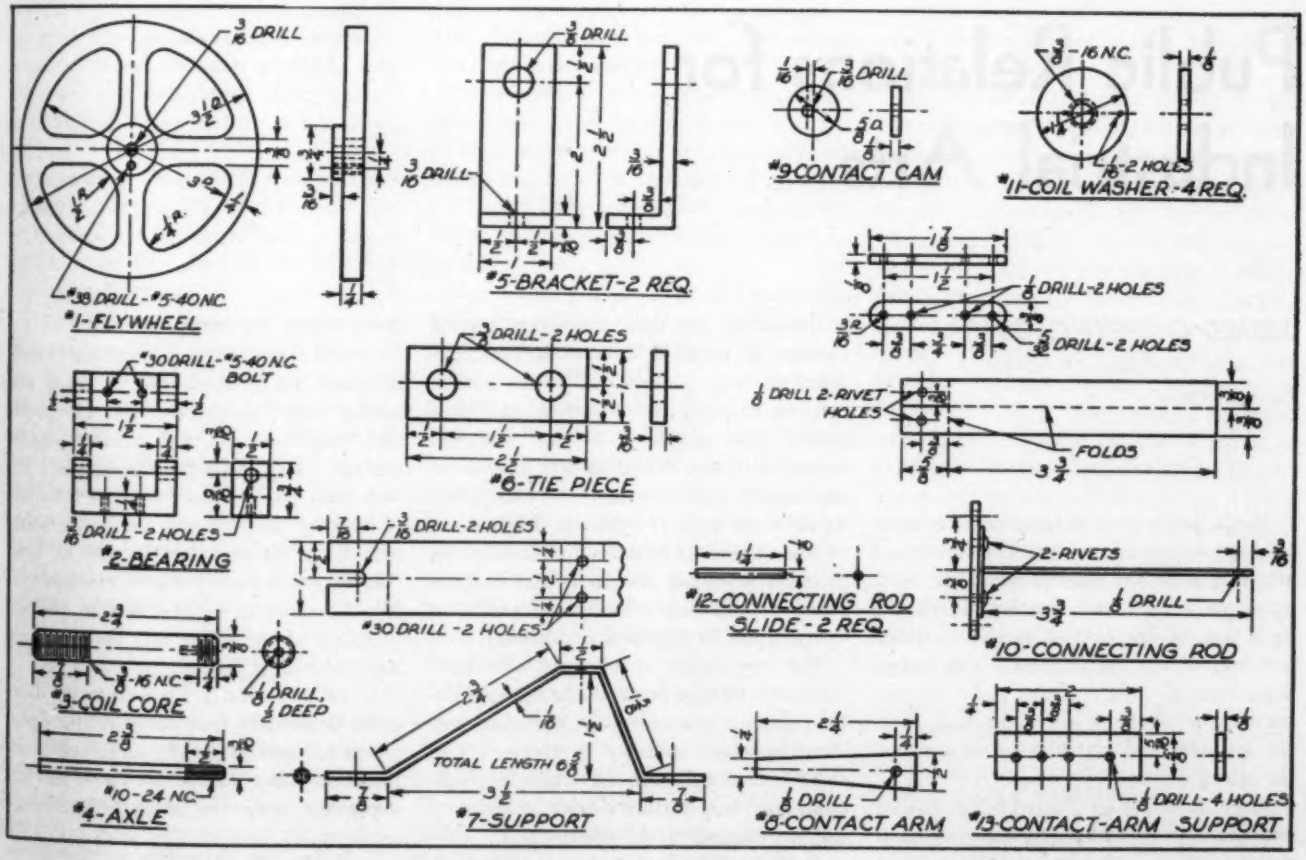


Fig. 3. Details of electric motor

riveting, coil winding, thread cutting, woodworking, wood finishing, wood fastening, soldering.

In order to operate the motor efficiently the following principles must be learned and applied: bearings, eccentrics, commutation, like and unlike polarity, open circuits, types of fits, amperage, electrical contacts, flywheels, electromagnetism, closed circuits, tolerances, voltage, resistance, and friction.

There are other projects involving more or less the number of processes and principles indicated. The motor is offered as one example only. Not enough time has been spent experimenting with *integration projects* to warrant a strong suggestion to teach by this method. In the writer's experience, however, few projects have elicited as much enthusiasm and interest; many fewer have presented as broad a scope of teaching potential.

The experienced teacher will immediately see three *D*'s in the plan presented: (1) *Dangers* — the danger of having all students working on the same project at the same time. This may lead to the stereotyped teaching of the old manual training concept. (2) *Disadvantages* — the disadvantage to the teacher and pupil of finding enough suitable integration projects. All units of construction might be measured by this one criterion. Such a standard would certainly narrow the quantitative production activities of the classes. (3) *Difficulties* — the difficulty of motivating all pupils to make a certain type of project. Some class members will have strong interests elsewhere, and as has been stated earlier, they should be given the opportunity to explore these interests.

If the plan to use integrating experiences is adopted, it should be followed with certain cautions. All students cannot be expected to receive a project with the same amount of zealousness. Expect to use a guiding and not a directing technique. Motivate the pupil to change and improve designs according to his desires and needs. Freedom of choice must be allowed — a dictatorial attitude has little place in our democratic philosophy.

The principle, which may be the educational beacon in this situation, is that subject matter cannot be pigeonholed — it must cut across departmental lines and the more lines that are cut, the better!

Acknowledgments

Grateful acknowledgment is hereby given to the following men, without whose help it would have been virtually impossible to arrive at the thoughts expressed in this writing: The Industrial Arts Staff of Ball State Teachers College, Dr. Fred J. Schmidt, Jr., chairman; Martin Davis, Designer of the "Integration Project," Industrial Arts Instructor, Daleville Public Schools, Daleville, Ind.; Edward Davis, Reproducer of the "Integration Project," student, Ball State Teachers College, Muncie, Ind.; Bernard Jouil, Photographer, Instructor of Graphic Arts, Ball State Teachers College, Muncie, Ind.; Stanley Ross, draftsman, student, Ball State Teachers College, Muncie, Ind.

Public Relations for Industrial Arts

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Dayton, Ohio

Much has been said regarding the need for improved public relations in industrial-arts education but not too much has been accomplished in that direction. It should be a part of the over-all public relations program of the entire school, not just a departmental policy since good school-community relations are dependent upon the attitudes and activities of all areas of the school.

More information regarding industrial arts needs to be disseminated among community groups. Unfortunately, the program of industrial arts has undergone several changes in name. This shifting has confused many people who fail to see accompanying changes in objectives and programs. The stages of *manual training*, *manual arts*, and *industrial arts* have come too closely upon the heels of each other to allow the general public to differentiate between them. An effective public relations program involving the industrial-arts department will help educate the public to the program as it is now organized.

The very nature of industrial arts lends itself well to help promote the school public relations program. It is the chief medium by which industry is represented in the school and as such may show in a concrete way how certain phases of industry are represented in the school shop.

Public relations has been defined in many ways, depending somewhat on the nature of the activities represented. Public relations has been defined as doing and saying things people like, the way people like them done and said. Another popular concept which is frequently expressed implies that public relations is an operating philosophy that informs the public about everything an organization does or says. Another, more closely related to schools, is: "Public relations is the sum of the impressions of the school and the people associated with it."[1]

It follows clearly then from the foregoing definitions, that public relations programs are not necessarily all turned in one direction. They may be both good and bad depending upon the nature, effectiveness,

[1] E. E. Holt, "Our Responsibility for Effective Public Relations," *Ohio Schools*, XXVIII (Nov., 1949), 340.

and reception of the public relations program. A program of good public relations becomes the aim of the school.

Again following the definition, public relations must not concern itself with publicity alone. Public relations embraces many activities other than "showing off," such as pupil-teacher relationship, parent-teacher co-operation, teacher-administrator harmony, community relations, professional relations, and many others of equal value.

The public is becoming more concerned with the schools as shown by increased P.T.A. activities; and lay, business, and industrial organizations that have helped pass bond issues and influence legislatures to aid schools.

As in every separate department within an organization it is the responsibility of the industrial-arts department to inform the public of the results and objectives of its work in order to further its own growth and development. The industrial-arts department is rich in the many opportunities which it has to accomplish this very fact.

The problem then becomes one of co-operation. How may the industrial-arts department help in school and community relations? Which methods of public relations are best suited for industrial-arts participation? What constitutes a balanced program?

The range of the problem should be sufficiently broad to apply to any school that has an industrial-arts department. It should not be static or inflexible. It must be dynamic and flexible.

One of the most important public relations problems lies in presenting a balanced picture of the school's entire program rather than much publicity on a few student activities. . . . The patrons need a true and interesting picture of the everyday life of the school. . . . By telling the community what they and their students are doing and have accomplished, teachers are doing their students, their departments, and their schools a service.[2]

The Questionnaire

The Twenty-Eighth Yearbook of the American Association of School Administrators used as its theme "Public Relations for American Schools." The book was prepared by a joint committee of eleven outstanding school administrators who explored the broad field of public relations of schools to indicate the need and effectiveness of such a program.

Briefly describing the contents, the first chapter explored the meaning of school public relations. Chapters two and three dealt with local needs and the fundamentals of school public relations. The value of co-operation between schools and laymen was shown in chapter four. The next four chapters deal with public relations opportunities and responsibilities of school boards, the superintendent's office, the school staff, and professional organizations. Chapters nine and ten discussed the public relations implications of policies and procedures in the areas of school management and school finance. The evaluation was treated in chapter eleven while the final chapter consisted of some of the most widely used techniques and media in public relations. It was this final chapter which provided most of the valid techniques and activities used as the core of the questionnaire.

Three groups of people were chosen to receive questionnaires, school administrators, industrial-arts educators and industrial public relations men.

In the school administrators group 65 were chosen from the educational directory of Ohio superintendents and principals for the year 1949–50. A spot method of selection was used to provide returns from different geographical areas and population centers.

The second group, industrial-arts educators, were selected from the 1948 Industrial Arts Teacher Education Directory. Whenever possible the recipients of questionnaires were the heads or acting chairmen of the industrial-arts department. Additional questionnaires were sent to individuals who have received recognition in the field of industrial arts. Seventy questionnaires were sent to this group in thirty different states, some states, of course, having several outstanding colleges or universities with industrial-arts education facilities.

The last group, public relations men in industry, were chosen from a roster of attendance at a national conference of public relations executives held in New York City, September, 1949. Sixty-five public relations men were selected from the list. Each man represented a different company or organization. No restriction was made as to geographical location within this group but recipients were chosen to include a diversity of industries.

An extra insert was sent along with the questionnaire to this latter group asking for specific suggestions and related information which might be of value in formulating a final program for industrial-arts participation in public relations.

While one hundred questionnaires were returned, the individual items were rarely checked one hundred per cent. This fact may be attributed to individual difference in interpreting the various media and their relationship to industrial-arts participation in public relations. However, this variation indicated in part that the questionnaire was answered carefully or with some consideration.

The rating of the public relations activities was determined by selecting those items which were chosen by the persons answering the questionnaire to be of the highest value. The activities then were separated using only those where the returns under highest value exceeded those of medium or low value. This method of selection eliminated several activities which were contained in the original list on the questionnaire.

An analysis of the tabular results showed those activities pertaining to exhibits, demonstrations and excursions to be of the highest value. Likewise, industrial-arts participation has a major part in this same classification which indicated that the industrial-arts department can play a major role in the school public relations program.

The next group that appeared in frequency of replies as being good public-relations activities was the newspaper with the items of pupil newspaper and human interest stories chosen for high value as a technique. While industrial-arts participation shown was not as high in rating, it indicated that the returns were answered with a view toward the entire school program rather than toward industrial-arts alone.

A breakdown of the entire list of the combined group with reference to frequency of choice follows:

Personal relationships	4
The newspaper	7
Radio and television	2
Slide films and motion pictures	1
Graphic and pictorial materials	2
Messages	1
Student publications	1
Miscellaneous publications	0
Reports	0
Exhibits, demonstrations, and excursions	8

[2] Glenn Vinson, "Administrators in Public Relations," *The Phi Delta Kappan*, XXVIII (Mar., 1947), 285.

TABLE I. Combined Group

Public relations activity	Value per cent	Ind. arts part. per cent
1. Activities and accomplishments of students	83	75
2. Live demonstrations	82	75
3. Out-of-school exhibits	79	80
4. Public appearances of pupils	75	64
5. In-school exhibits	74	61
6. Portable exhibits	71	69
7. Pupil newspaper	71	60
8. Human interest stories	70	55
9. Photographs for exhibits	70	69
10. Excursions of business and industry to school	69	62
11. Speeches before school-patronage groups	67	62
12. Leader of youth organizations	66	60
13. Information about the school (radio)	65	51
14. Photographic exhibits	64	62
15. Straight news items	64	51
16. Activities and accomplishment of teachers	63	55
17. Arts and crafts radio program	62	66
18. Photographs for reproduction	62	58
19. Speeches before industrial groups	60	65
20. Special issue articles	60	60
21. Speeches before service clubs	60	48
22. Open letters and announcements to parents	56	45
23. School excursions	55	58
24. Editorials	55	35
25. Slide films and motion pictures to interpret needs of school	52	54
26. School magazine	52	48

Added Suggestions for Improvement of Public Relations

A part of the questionnaire gave opportunity for those replying to offer suggestions concerning the improvement of public relations through industrial arts. Many suggestions were received listing specific items or activities which they personally had found of value. The most frequently mentioned are:

Open house or open shop
The Industrial Arts Award Fair
The Hobby Fair
The State Fair
Home visitation
Utilization of community resources
Pupil placement
Vocational guidance
School assemblies
Industrial arts awards sponsored by local industry
Adult classes
Occupational therapy
Recreational programs

These added suggestions were in line with the major trend toward exhibits, personal relationships, and activities in which there was greater pupil participation which was also revealed from the questionnaire tabulation.

Few additional suggestions were offered by school administrators. Those that were added were largely of pupil-teacher relationship or public relations through performance of duty. This group showed less interest in the program than either of the other two, yet they are the administrators of the school public relations program and as such determine the extent of industrial-arts participation. This seeming indifference indicates a need for renewed effort on the part of industrial-arts teachers to improve their activities in the school public relations program. The following quotation from one of the returns illustrates this point:

> Under industrial-arts participation, I assume that you wish to know specifically how industrial arts, as a subject, lends itself to the carrying on of certain projects. When I checked an item as "minor" I mean that industrial arts does not particularly lend itself to better advantage than another subject for the carrying on of a specific project.

This individual checked only 15 items in which industrial arts played a part in the public relations program. Six of these items were under graphic and pictorial materials, apparently showing that his particular school has a strong graphic arts department.

The most detailed suggestions for improvement of public relations came from the public relations men in industry. Many were sincerely interested in such a program for the schools and contributed such suggestions as:

Business-education days
Exploitation of those opportunities inherent to industrial arts
Teacher-community co-operation
The *House Organ* type of publication
Information pertaining to the philosophy, the curriculum or teacher or pupil evaluation
Constant effort toward better public relations

These items are typical of the comment received but are general rather than specific in nature. Apparently industry is concerned with what the schools are doing in their entire program.

Several of the responses were quite lengthy and detailed. They listed methods and media used by industry to promote public relations.

In addition several companies forwarded printed material used by them in their own programs and which were used in many instances when the final program was outlined.

Application and Recommendations

One of the most significant findings from the returns was the underlying philosophy of co-operative endeavor. Several questionnaires from each group mentioned that whatever is good public relations in industrial arts is good for the entire school. The objective of this study was to determine those factors of public relations in which industrial arts could best participate.

The results of this study indicated that the most valuable agencies for industrial-arts participation are in order of their frequency: (1) exhibits, demonstrations and excursions; (2) the newspaper; (3) personal relationships; (4) radio and television; and (5) graphic and pictorial materials.

These five general classifications included many media to promote public relations, each of which is here discussed more fully in regard to industrial-arts participation.

The most popular techniques chosen were those in which industrial arts has participated in the past. In former years the tendency has been to use displays of an inanimate nature such as an exhibit of projects at open house or a store window display. According to the results of this study there is a demand for greater pupil participation.

Application to Educational Procedures

Exhibits, demonstrations, and excursions. As shown in Table I, the activity of live demonstrations was selected as the second most valuable item for school public relations. Industrial-arts participation was also rated high for participation in this activity. A review of available literature did not produce much information on this particular topic. However, such an activity consists of a student performing a manipulative function whether it be the operation of an engine lathe or the rendition of a difficult score on the piano. The industrial-arts department has many such opportunities to provide demonstration as: wood turning, wood finishing, painting, metal spinning, screw machine operation, molding and foundry practice, welding, clay modeling, electrical work, printing technique, leathercraft.

Any one of these and many others have made excellent media for student demonstrations. A successful program may be insured by preliminary planning and choosing the appropriate activity to be performed.

Out-of-school exhibits are valuable publicity channels and as such should be fully utilized. Many school exhibits have passed

their materials stressing quantity instead of quality. They failed to see the psychology involved in a careful arrangement of a Fifth Avenue store window.

At the National Industrial Arts Awards Fair in Chicago, each project was carefully and separately displayed to its best advantage regardless of the particular classification of articles. The appearance of the whole show was one of studied simplicity to bring out the most effective display.

Opportunities for such displays available to schools are: local community meetings, country fairs, state fairs, industrial shows, National Industrial Arts Awards Fair.

All of these and others have a mass attendance and reach a great many people not otherwise touched.

In-school exhibits and portable exhibits are devices used to show the relationships of industrial arts to the total school program by displaying various projects within the immediate school surroundings.

The Newspaper. The responsibility for the release of items to the papers lies with whoever is appointed to take care of this task. Two methods of preparation are generally used: (1) the presentation of prepared articles to the press or (2) providing information for staff reporters who in turn prepare the articles for publication.

To interpret the industrial-arts participation properly will be the responsibility of the department head or the teacher. If the first method of preparing articles is used it must be done by someone who is sufficiently trained in the art of writing if a favorable opinion is desired. Generally, editors look more kindly upon staff written articles as they are more able to detect whether or not the event or activity is newsworthy.

When such items are published, the students should be instructed to look up this news in the paper. This is one of the most valuable ways of bringing industrial arts to the home and to the community as a whole.

Personal Relationships. High in the list of desirable activities were the several items pertaining to personal relationships.

The local director of industrial arts frequently maintains membership in various civic organizations and service clubs, such as the Chamber of Commerce, Rotary, Kiwanis, Lions, and other similar organizations. Membership in these organizations provides opportunities for firsthand contact with large numbers of representatives from business and industry. It is not necessary for each teacher to be affiliated with such a group, but the department should be represented. In the larger communities the director of industrial arts performs this duty while in the smaller schools the teacher is the representative. However, in either situation it is possible for either teacher or director to appear before many such groups and present information concerning phases of the industrial-arts program.

The membership in civic organizations and service clubs is usually truly representative of the business and industrial life of the community. By promoting training programs through these clubs and organizations, a large representative group of business and industrial leaders is reached.

Radio Publicity. The radio is one of the most popular means of disseminating information concerning school activities. Radio stations are generous in providing adequate time for a series of programs, an occasional program or spot announcements. When arrangements are made for a series of programs to be broadcast weekly they are usually planned in multiples of 13, that is, four sets of 13 programs each year. It is frequently possible to arrange for 15-minute broadcasts once each week for 13 consecutive weeks.

When some new phase of the program justifies such publicity, radio stations will usually arrange to provide 15-minute or 30-minute periods for the dissemination of information of interest to the public. In special drives or in connection with something new in the way of training, radio stations will frequently arrange spot announcements of from one to three minutes.

Due to its relative infancy, such definite information could not be obtained from the television networks. The opportunity for a project such as an arts and crafts show should be attractive to both sponsor and listener.

Graphic and Pictorial Materials. Both methods chosen from this group dealt with photographs to use as media. Photography, as a unit of industrial arts may produce photographic shots of a candid nature showing in detail many important and interesting aspects of school life. Another use could be the preparation of glossy prints to use for publication.

Since the activities chosen were photographs for exhibits and photographs for reproduction, the former could be classified with exhibits, demonstrations and excursions and the latter under the heading, newspaper.

Photographs have been recognized as a major part of publicity and contribute much to a printed article in a newspaper or in a magazine.

Recommendations for Industrial-Arts Participation

From the results of the questionnaire as shown in Table I and from the added suggestions of industrial-arts educators, school administrators, and public relations men in industry and a survey of available books and periodicals as listed in the bibliography the following outline was prepared to show how the industrial-arts department can best co-operate in the school public relations program.

Functions Best Served by the Industrial-Arts Department

I. Most useful function of the director or administrator
  1. Personal relationships
    a) Speeches before service clubs
    b) Speeches before industrial groups
    c) Speeches before school patronage groups
    d) Leader of youth organizations
  2. The newspaper
    a) Editorials
    b) Activities and accomplishments of teachers
    c) Straight news items

II. Most useful function of the teacher
  1. Personal relationships
    a) Speeches before school patronage groups
    b) Leader of youth organizations
  2. The newspaper
    a) Activities and accomplishments of students
    b) Human interest stories
    c) Special issue articles

III. Most useful agency of the student
  1. Personal relationships
    a) Speeches before school patronage groups
  2. The newspaper
    a) Photographs for reproduction
  3. Exhibits, demonstrations, and excursions
    a) Live demonstrations and excursions
    b) Out-of-school exhibits
    c) Public appearances of pupils
    d) In-school exhibits
    e) Photographic exhibits
    f) School excursions
  4. Radio and television
    a) Arts and crafts show
    b) Information about the school

Conclusion

Virtually every news story, radio broadcast, school exhibit, public speech or any of the public relations media is used to achieve some specific goal. However, in developing the program of industrial-arts participation the long range view must not be overlooked.

A past successful experience provides the foundation for succeeding devices and techniques. Likewise, one which is not favorable should be discarded in the interest of the school. It is important that the reception of these activities be carefully watched and the good results be used as a basis for building a successful program of public relations.

To vary the approach the industrial-arts department should include many of the different media when presenting its program through the school. A change of content, form, and arrangement will increase the interest of both participants and the public.

The public relations program needs the active support and interest of the entire school staff. This study has indicated those factors in which industrial arts is strong. Many teachers from other departments have been better trained to supervise some of the activities than industrial-arts teachers. By interdepartment co-operation all staff members can improve their abilities to work with each other, students, parents, and community organizations. The degree of success achieved by the use of the public relations activities selected by this study depends upon the choice of technique, the proper interpretation to the public, and the co-operation of school-home-business-industry-community.

PROBLEMS AND PROJECTS

SMALL WALL MAGAZINE RACK

ROD HOBSON
Industrial Arts Instructor
Winona State Teachers College
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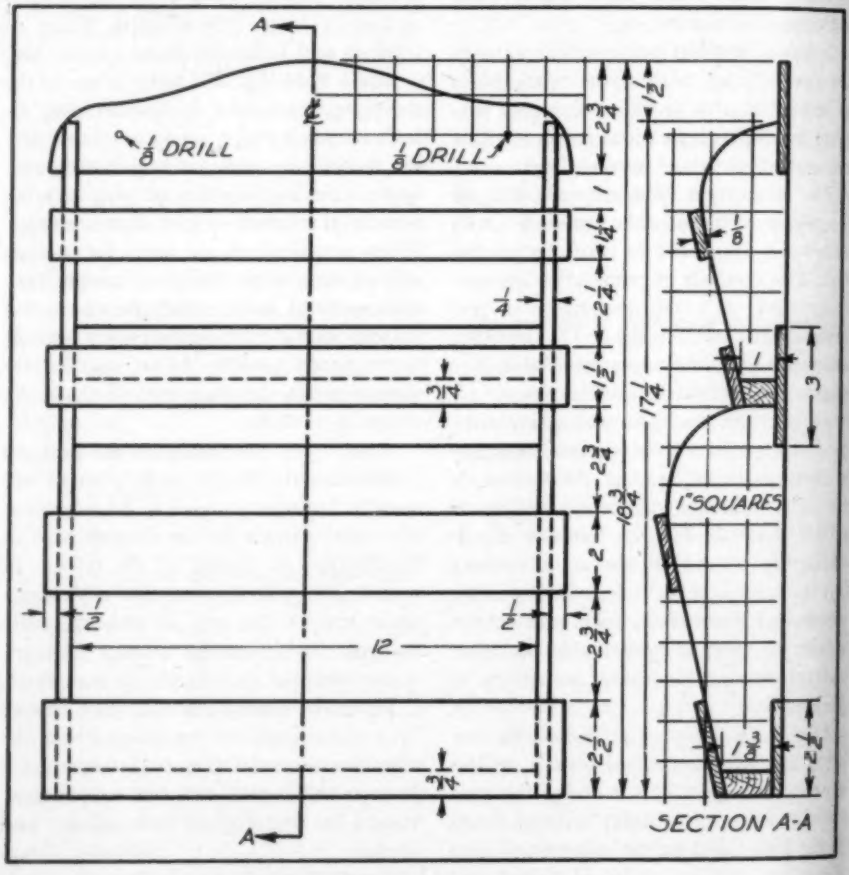
The wall magazine rack shown herewith is rather novel in design and size. Its size allows it to be mounted on small wall surfaces, or even on the back of a door. It is a convenient holder for current magazines, and discourages the practice of keeping unsightly, torn old issues out in view.

As a project it can be adapted to either hand or machine operations. It was originally developed to emphasize fundamentals of design. A pleasing combination of straight and curved lines was employed, with solid and open divisions of space supplying added interest.

Small wall magazine rack



Details of small wall magazine rack

Note that the mass is divided horizontally into smaller rectangles, the largest (or heaviest) being on the bottom. The slats decrease in width, as do the openings between them, from bottom to top. This provides illustrative material for a discussion of stability and space division.

The project illustrates effectively how function, materials, and feasible methods of construction actually determine the basic design of the product. Working from this base, the application of good design techniques simply adds eye appeal. Good design cannot alter

function, or make unreasonable demands upon materials or methods of production.

The magazine rack pictured was constructed of walnut. Three-quarter-inch stock was used for the two compartment bottoms. More of this stock was split on the circular saw, and then run through the planer to obtain ¼-in. material for the two end pieces, and ⅛-in. material for front and back slats.

The jig saw and drill press were also used in the fabrication process to give the students maximum experience on machines and hard wood at a minimum of cost.

The project serves equally well as a hand woodwork project. Softwood may be substituted for walnut. Orange crates and apple boxes provide stock of usable thickness at utmost economy. Here, however, use heavier box ends for vertical ends of rack as well as for compartment floors. Reasonable care in sanding and finishing operations will yield a quite respectable appearing project.

Assemble hardwood with small r.h. blued wood screws; softwood with glue and brads. Hang on wall or door with two small nails through the holes in the headpiece.

CABINET FOR FILING PLANS, REFERENCE MATERIAL, AND THE LIKE

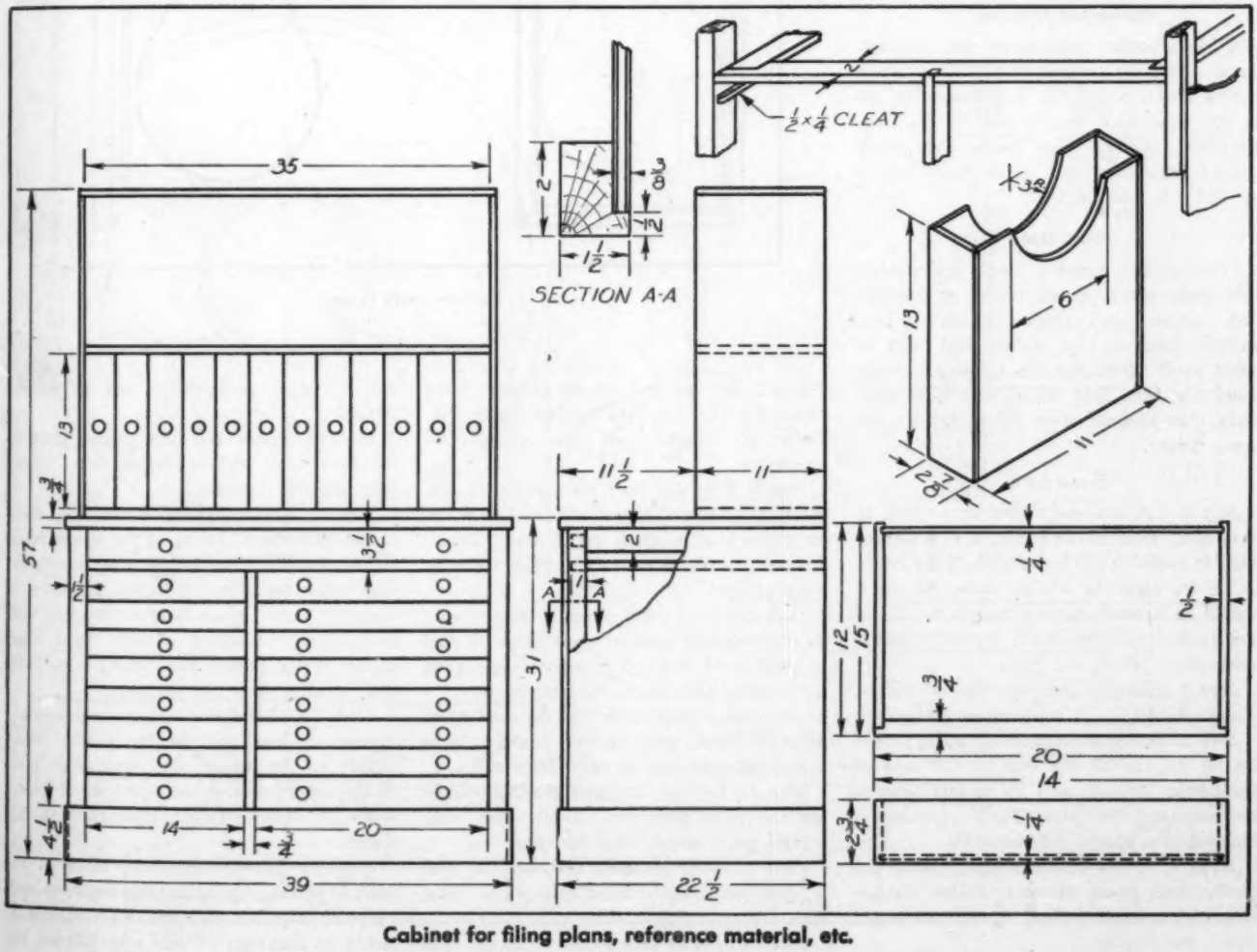
RICHARD NOYES
High School
Moorestown, Burlington Co., N. J.

Keeping blueprints, drawings, and plans cut from magazines readily available and in order is a difficult problem in industrial-arts classes. We have tried numerical and alphabetical systems with a catalog sheet but no method worked well. This cabinet has solved the problem by the use of color.

The cabinet provides 12 cases of a size to take standard 9½ by 11½ commercial folders, and eight drawers each for 9 by 12 and 12 by 18 blueprints or drawings. The long drawer is for full sized patterns and the top shelf for books and magazines or it will take 12 more cases if needed.

After shop magazines are a month or two old, they are taken apart and plans that are suitable for our use are stapled in the folders and labeled. As we make up blueprints or drawings they are stored in the drawers. The filing cases have colored labels pasted on them and the name of the plans contained in them — e.g., red tables, blue toys, etc. The drawers have the same color labels but do not need the printed title. All folders, blueprints, and drawings have a colored label to correspond to that on the filing case. There are four more filing cases than drawers and these are used chiefly by the instructor for tests, related information, machine instruction material, etc., not usually made into blueprints and therefore not needing drawer space. These also have colored labels and titles. For color use we use construction paper from the art department cut in strips 1 by 2¾ in. for the filing case labels — ½ by 3 for plans. We keep a supply ready to paste on new plans as we get them.

With this system it is very easy for the teacher to tell pupils where to look for plans and just as easy for the pupil to put them back in the right place. An occasional check by even the least intelligent pupil can quickly find any that have been misplaced.



Cabinet for filing plans, reference material, etc.

The construction may be altered, using ¾ solid wood or plywood for ends and top. We used the frame construction and ¼ plywood for greater economy.

The drawers slide on ¼ by ½-in. strips, nailed to the sides of the case with corresponding grooves cut in drawer sizes before assembling.

FLOWER WALL VASE

MERITT O. RICHMOND
Shop Teacher
Public School 201
Brooklyn, N. Y.

The flower vase described herein is a very suitable industrial-arts project. It is made of glass, wood, and copper, and requires a number of basic hand tool processes. It can be made by the average seventh-, eighth-, or ninth-grade boy.

The project requires a glass bottle of any kind, type, or size. However, one about 5 to 8 in. tall of attractive shape and made of colored glass would be ideal.

Materials Needed

A glass bottle (convenient size, pleasing shape, and color), wood (any kind of wood can be used), copper (B. & S. gauge No. 24 or 20), sandpaper No. 1½ and No. ½, steel wool No. 2/0, wood stain, shellac, clear metal lacquer, escutcheon pins ⅛ by ⅜ in., No. 7 by 1-in. f.h. wood screws.

Tools Used

Crosscut and ripsaws, plane, try square, rule, sharp pencil, gauge, bit brace, countersink, scriber, prick punch, tin shears, iron workers' hammer, fiber mallet, steel block or small anvil, 10-in. flat file (smooth), round wood tile, hand drill, 1/16-in. and ⅛-in. twist drills, claw hammer, screw driver, brushes (to apply finish).

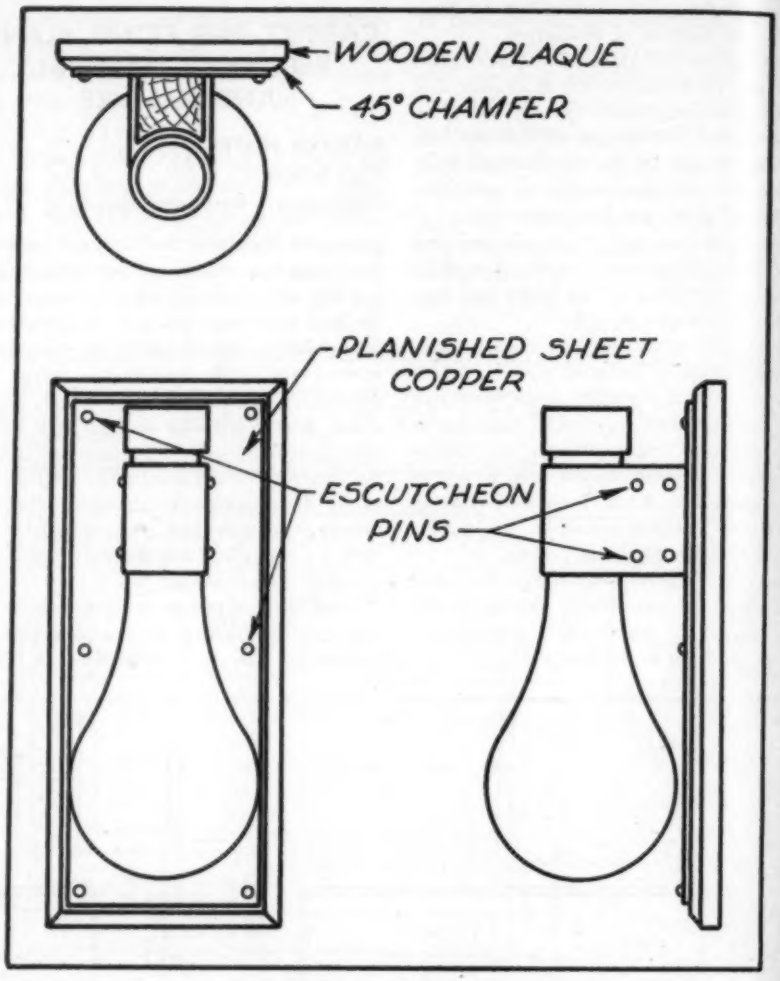
Procedure

Step 1. Cut out and square up a piece of ⅜ or ½-in. stock to the proper size. Whatever wood is available will be suitable. If the bottle is 6½ in. high and 2½ in. wide, the stock should be squared up to ⅜ by 3¼ by 7½ in. Tools: steel rule, try square, rip and crosscut saws, sharp pencil, and plane.

Step 2. Chamfer the edge 3/16 by 3/16 in. Tools: plane.

Step 3. Square up a piece of stock 1 by 1 by 1½ in., and fit one edge to the neck of the bottle. This block is the spacer between the back and the bottle. Tools: plane, combination saw, gauge, and round file.

Steps 4, 5, and 6. Sand paper, stain, and shellac both pieces of stock. Follow instructions for wood finishing. Tools: sandpaper, block, and brushes.



Flower wall vase

Step 7. Lay out and cut one piece of sheet copper 2⅝ by 6⅞ in., and another 1½ by 5 in. Tools: try square, steel rule, scriber, and tin shears.

Step 8. True and burr both pieces of copper with a file, flatten out with a fiber mallet on a block of steel or small anvil. Tools: Smooth flat file, fiber mallet, small anvil, or block of steel.

Step 9. Planish both pieces of copper with an iron workers' hammer on a block of steel or small anvil. The copper will curl up during the process. This should be flattened out as it occurs with a fiber mallet on the steel block or anvil. Tools: iron workers' hammer (6 or 8 oz.), block of steel or anvil, fiber mallet.

Step 10. Lay out and prick punch the holes for the escutcheon pins. Tools: steel rule, scriber, prick punch, claw hammer.

Step 11. Drill the holes thus laid out with a 1/16-in. drill. Tools: hand drill, 1/16-in. twist drill.

Step 12. Polish both pieces of copper with No. 2/0 steel wool. Polish only in one direction.

Step 13. Fasten the large copper plate to the wood back with escutcheon pins. Tools: rule and claw hammer.

Step 14. Lay out and drill two ⅛-in. holes to facilitate the fastening of the spacer block to the plaque. Countersink from the back. Care must be taken to locate the holes so that the bottle, when fastened in place, will be properly centered. Tools: steel rule, scriber, prick punch, hand drill, ⅛-in. twist drill, counter sink, and bit brace.

Step 15. Bend the small copper plate around the neck of the bottle and fasten tightly to the spacer with escutcheon pins. If the copper strip is too long trim off excess with tin shears. Tools: claw hammer, tin shears.

Step 16. Fasten the spacer block to the plaque making sure that the bottle is well centered. Use No. 7 or No. 8 f.h. screws. It might be necessary to drill pilot holes in the

spacer block to prevent splitting. Tools: rule, screw driver.

Step 17. Remove all fingerprints from copper and give copper a coat of clear metal lacquer. Tools: a good brush or spray gun.

CLOTHES HAMPER

WALTER W. LLOYD
Sylvania-Burnham High School
Sylvania, Ohio

Procedure

1. Lay out the bottom, item 6, according to the dimensions given.

2. Square the ends of the bottom and cut the 2½-in. radii.

3. Cut out the four pieces for the top of the frame; also the three pieces for the lid. Use No. 2 white pine.

4. Cut the groove on each of the side pieces for the top frame and the lid. This type of construction is used to prevent the warping of the lid.

5. Cut the tenons on the front and back rails of the frame, and cut the tongue on the center piece of the lid.

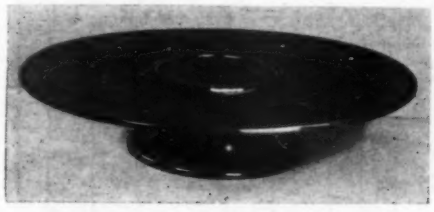
6. Glue and nail the joints, then place them in clamps.

7. Cut the two back braces.

8. Assemble the bottom, back braces, and the top frame.

9. Cut the back out of ¼-in. fir plywood and nail it to the back.

10. Lay out the pilot holes for the screws that attach the aluminum to the frame. These holes should be ⅜ in. from the edge and on 2-in. centers for all edges.



Lazy Susan by Louis Barocci

11. Lay out the ventilation holes. These holes are ¼-in. diameter and on 2-in. centers. There should be a row of holes 2 in. from the top and another row 2 in. from the bottom. The third and fourth rows are 4 in. from the top and bottom respectively.

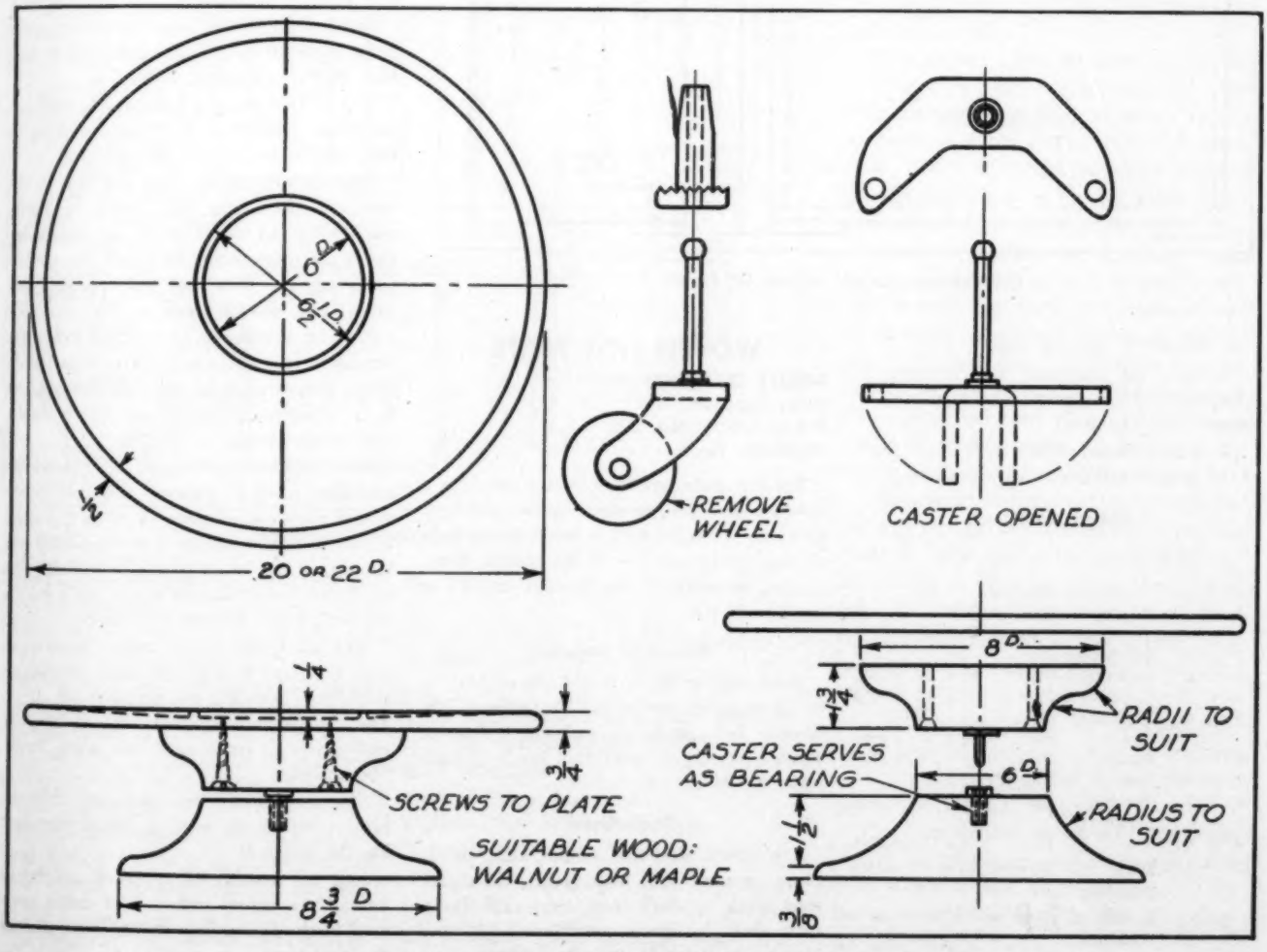
12. Drill all holes with a portable electric drill.

13. One inch from the end mark a line across the end of the sheet of aluminum. The aluminum is then bent 90 deg.

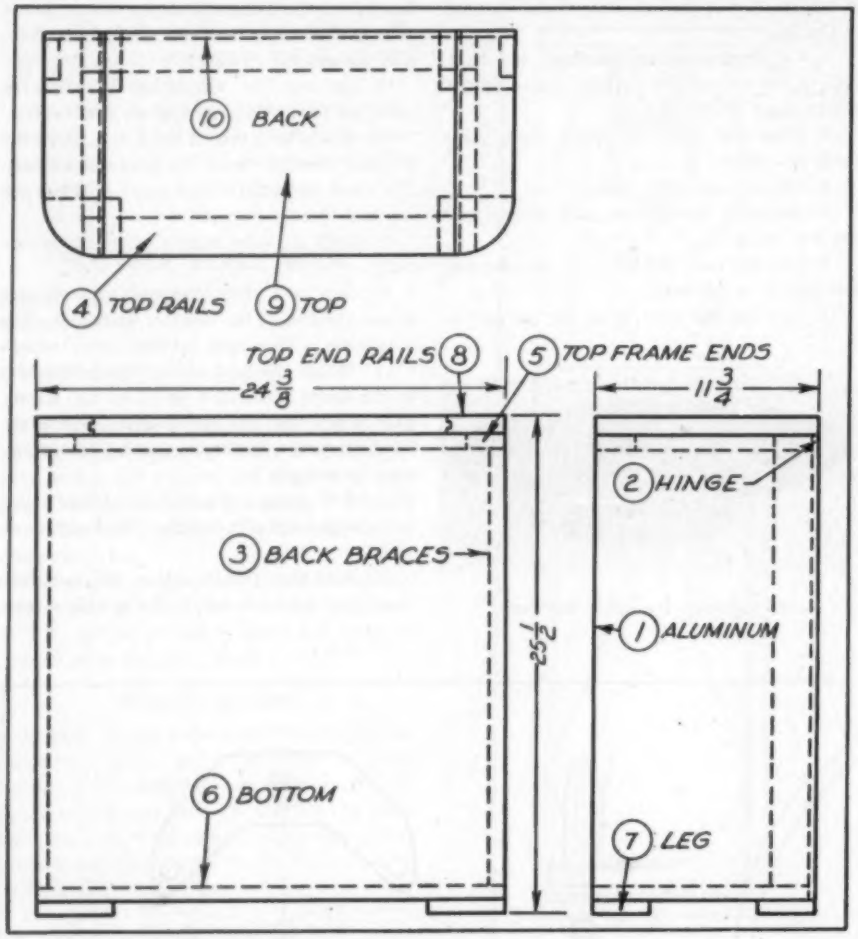
14. Mount the back of the aluminum sheet to the frame with No. 5 by ¾-in. r.h. screws, and fasten the top and bottom alternately. This procedure facilitates getting the aluminum on straight.

15. A *C* clamp and a bar clamp were found to be very helpful in holding the aluminum in place.

16. Fold the opposite end of the aluminum sheet and fasten it to the back with screws.



Lazy Susan submitted by Louis Barocci, High School, Cudahy, Wis.



Clothes hamper by Walter W. Lloyd

17. Mount the lid with hinges.

18. Clean the aluminum with kerosene or turpentine and then apply a coat of enamel or lacquer to the hamper.

19. A decal placed at the center of the front of the hamper will add to its appearance.

BILL OF MATERIAL

Part No.	*No. of Pieces*	*Description*	*Material*	*Size*
1	1	22-gauge	Aluminum	24 x 48
2	1 pr.	Butt hinges	Brass	2 in.
3	2	Back braces	Pine	¾ x 2 = 22½
4	2	Top rails	Pine	¾ x 2 x 20⅜
5	2	Top frame ends	Pine	¾ x 2 x 11⅝
6	1	Bottom	Pine	¾ x 11½ x 24⅛
7	4	Legs	Pine	¾ x 3 x 4
8	2	Top end rails	Pine	¾ x 3 x 11¾
9	1	Top	Pine	¾ x 11¾ x 18⅜
10	1	Back	Plywood	¼ x 24 x 24⅛
		Finishing nails	Steel	4d
		Finishing nails	Steel	6d

WOVEN HOT PLATE

MERITT O. RICHMOND
Shop Teacher
Public School No. 201
Brooklyn, N. Y.

The hot plate described in this article is a woven copper mat mounted on two pieces of plywood, protected with a felt bottom. It is an ideal project for use in the modern home. It can be made by the average eighth- or ninth-grade boy.

Materials Needed

Sheet copper (B. & S. No. 20 or 24), ¼-in. plywood or equivalent, No. 3 by ½ f.h. screws, felt, potassium sulphide (liver of sulfur), paint, glue, steel wool No. 2/0, sandpaper No. ½ and 1½.

Tools Used

Try square, steel rule, scriber, sharp pencil, plane, crosscut saw, fiber mallet, tin shears, steel block or small anvil, hand drill, 9/32-in. twist drill, bit brace, countersink, 2 wood blocks 1 by 1 by 5¼ in., screw driver.

Procedure

Step 1. Square up two pieces of ¼-in. plywood to 5½ by 5½ in. (If these pieces are undersized the copper strips have to be cut less than an inch wide.) See Part A in illustration. Tools: steel rule, try square, sharp pencil, crosscut saw, plane.

Step 2. Drill and countersink one of the pieces of plywood as shown. Tools: try square, sharp pencil, hand drill, 9/32 twist drill, countersink, and bit brace.

Step 3. Sandpaper both pieces of stock. tools: sandpaper block.

Step 4. Paint the edges of the piece of plywood which has been drilled with yellow or green enamel. Tools: small paint brush.

Step 5. Lay out and cut 10 strips of copper as shown at *B*. Tools: steel rule, try square, scriber, tin shears.

Step 6. Flatten out all strips with a fiber mallet on a block of steel or small anvil. Tools: fiber mallet, small anvil, or block of steel.

Step 7. True up and burr all strips with a smooth flat file. Polish with steel wool No. 2/0. Tools: flat metal file, No. 2/0 steel wool.

Step 8. Lay out and bend five of the copper strips as shown at *C*. Tools: brake, jig or vise, fiber mallet, try square, scriber.

Step 9. Lay out and bend five of the copper strips as shown at *D*. Tools: brake, jig or vise, fiber mallet, try square, scriber.

Step 10. Arrange all strips and hold in the vise with the aid of the 1 by 1 by 5¼-in. wood block, as shown at *E*. All spaces between the strips should be equal. The upright strips are the ones bent only on one end. Tools: vise, wooden block.

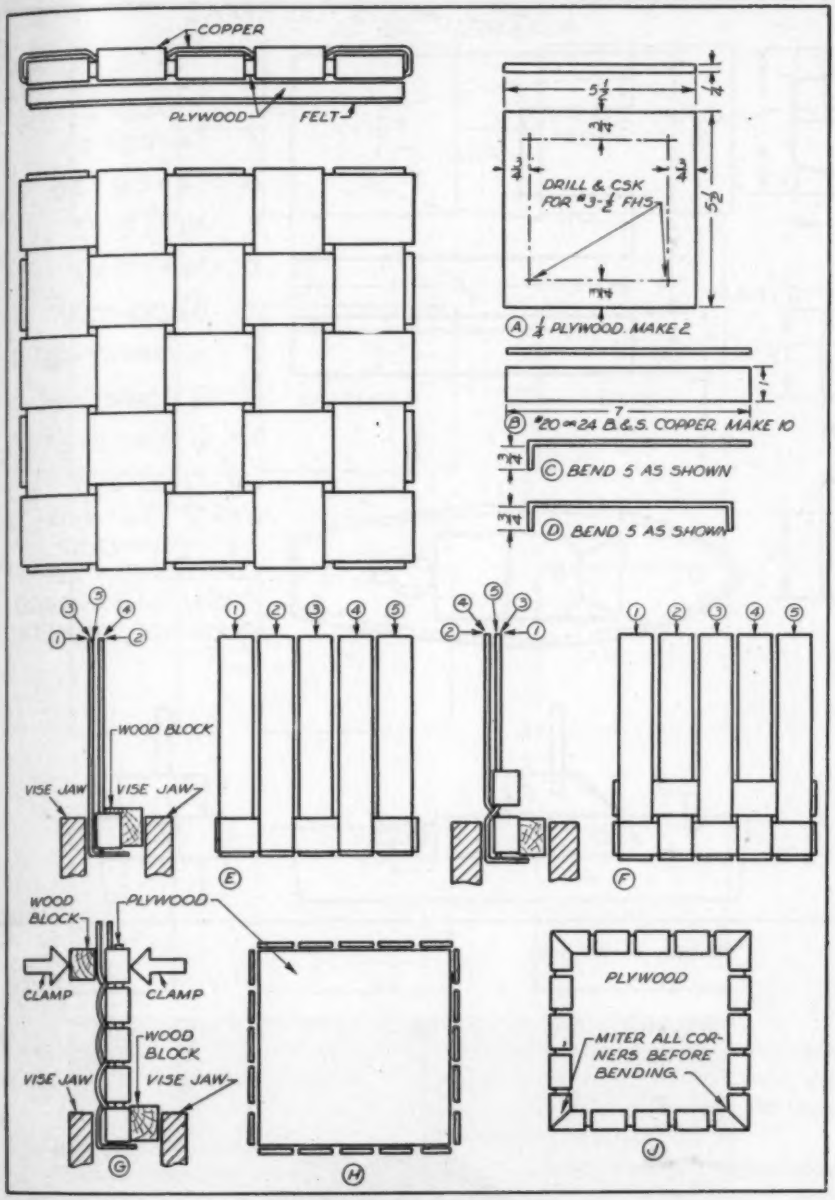
Step 11. Holding as in Step 10, weave the remaining four strips in place as shown at *F*. When they are all in place there should be ¾ in. of strips 1, 2, 3, 4, and 5 left. Tools: vise, wooden block.

Step 12. Remove from the vise. Insert the unpainted piece of plywood and hold in the vise as shown at *G*, plate IV, with two small C clamps and a block of wood. Clamp the top part of the hot plate as shown in drawing *G*. Tools: two blocks of wood 1 by 1 by 5¼ in., two small C clamps, and vise.

Step 13. Using a fiber mallet, bend strips 1, 2, 3, 4, and 5 at a right angle so that all strips now resemble the strips shown at *D*. The clamps and plywood used in Step 12 enable you to get a nice true bend. Tools: fiber mallet.

Step 14. Remove the clamps and take the project out of the vise. It should now look like the sketch *H*.

Step 15. Remove the plywood and flatten out all unevenness with a fiber mallet on a steel block. Tools: fiber mallet, block of steel or small anvil.



Details of woven hot plate

Step 16. Color the entire copper part of the project by submerging it in a solution of liver of sulfur.

Step 17. Dry the project.

Step 18. Insert the plywood and miter the four corners with tin shears, as shown at *J*. Tools: tin shears.

Step 19. Bend the ends of the strips around the plywood as shown at *J*. Use a fiber mallet. Tools: fiber mallet.

Step 20. Steel wool the project to get the desired finish. Go only in one direction. Do not use a circular motion. Use No. 2/0 steel wool.

Step 21. Fasten the painted piece of plywood to the bottom of the woven mat with No. 3 by ½-in. f.h. screws. Tools: small screw driver.

Step 22. Glue a 5⅞ by 5⅞-in. piece of felt to the bottom of the project.

PUTTING INDUSTRY IN INDUSTRIAL ARTS

ROD HOBSON
Industrial Arts Instructor
Winona State Teachers College
Winona, Minn.

A production project really is an adventure! Certainly it is for the students, and probably (with apologies where due) for the instructor as well.

Of all experiences we are able to give in the average industrial-arts shop, the experience of production line methods is one of the best for simulating actual conditions found in industry. It is also more richly endowed with desirable teaching content than almost any other type of project.

The production project lends itself readily for use at almost any level. The writer has successfully used it from the fifth grade up. Generally, any project suited to construction by the individual may be adapted to the production system. Certainly we shop teachers need not wait until welding or machine shop is to be taught to introduce the student to these production methods. In fact, it is impractical in most school shops to duplicate factory processes. We must usually be content to simulate, approach actual products and methods as close as possible, and rely upon our skill in presentation and the imagination of the students to make the analogy complete.

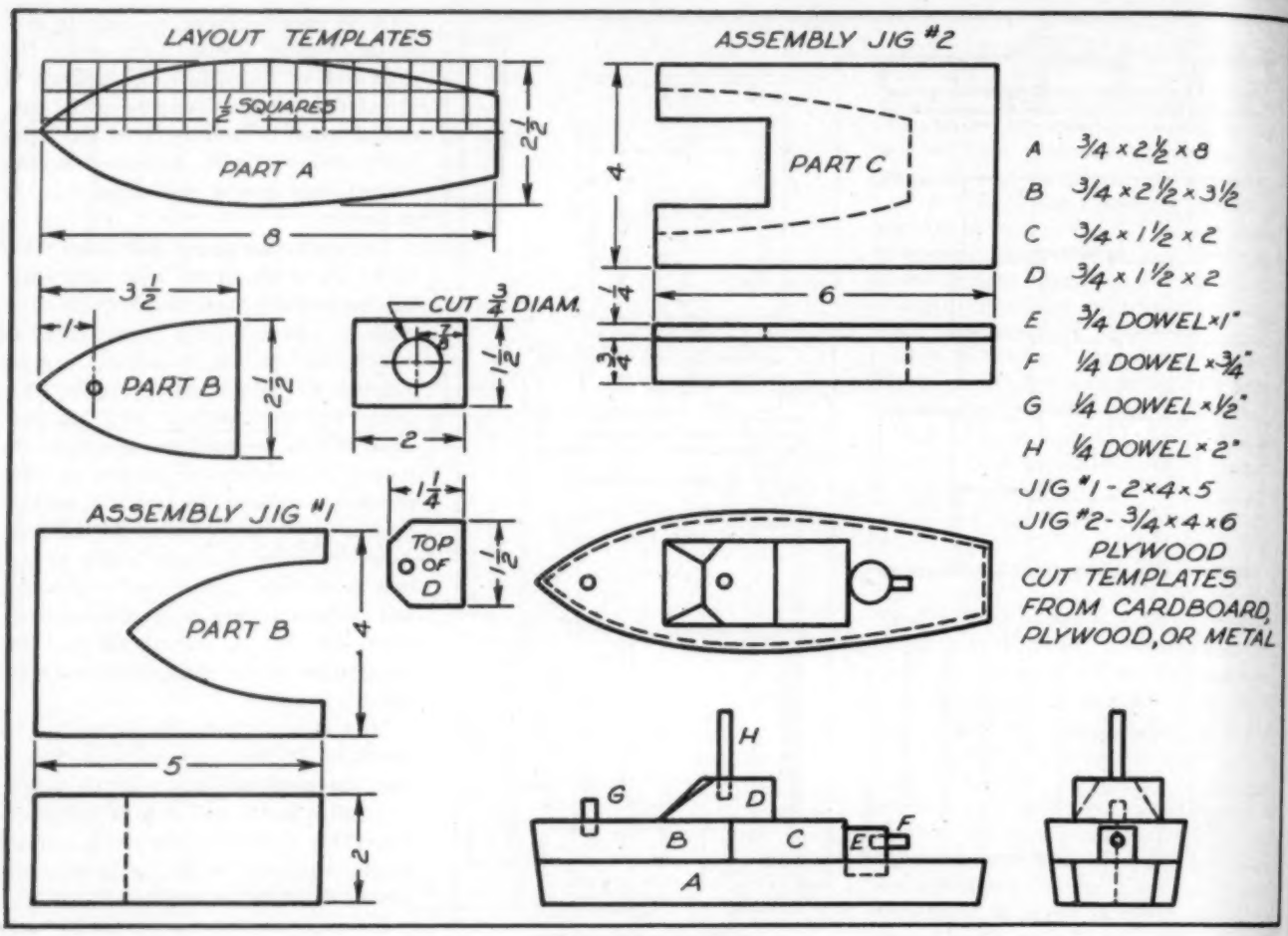
Most of our school projects are for the individual to plan and construct, for we wish the pupil to have as much variety as possible in the use of tools and materials. This is desirable for giving a broad general education below the levels where salable skills are the objective.

However, the average industrial wage earner is not called upon to do a wide variety of jobs. His work is specialized, and in very few cases is one craftsman responsible for the entire fabrication process. Should we not let our students occasionally sample the type of job he will most likely fill if he chooses an industrial career in post school employment?

The production project is a relatively simple way for the shop instructor to provide students with one of the most enjoyable adventures in learning during their school years. It is simple because, to be effective, the students must do nearly all the planning and work! The instructor need only be well informed and be able to guide the unit in its early stages. The pupils largely direct their own activities, and the teacher may ride the crest of the wave and serve mainly as technical adviser.

The time needed varies with the complexity of the chosen project, but in most cases it will be less than that required for the class members to make the same project individually.

The unit transcends the artificial bound-

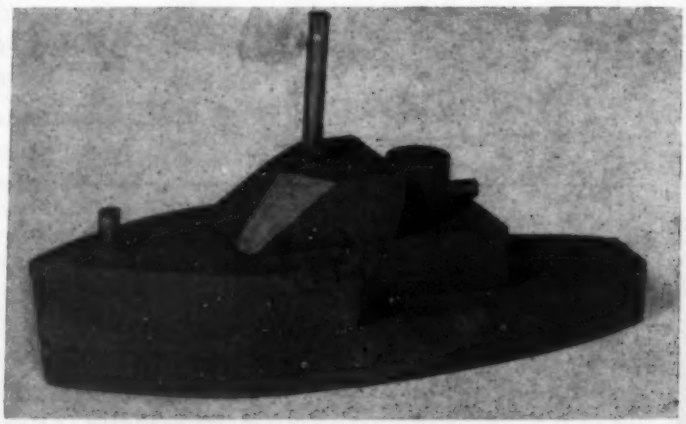


Details of PT boat

ary lines between subjects. Social studies, mathematics, and English are all needed, just as in life outside of school.

The pupils feel the stimulating effect of co-operative effort. If one worker *slows down* or *strikes*, the whole group is affected. The need for proper planning is brought sharply into focus because a poor quality job by one person affects the value of the resulting product. Problems besetting a modern industry are more readily grasped.

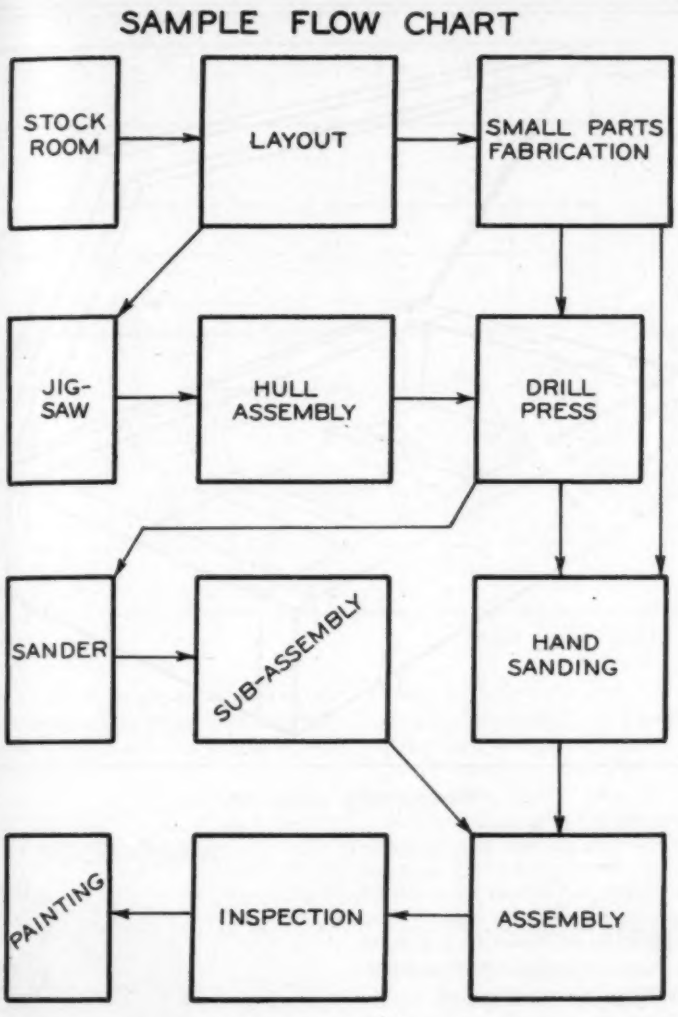
That specialization increases speed and efficiency is soon apparent. If the same time is allowed for the production project as would normally be allowed if it were for individual construction, the class can graphically and tangibly see that more than one completed unit per student represents a *profit*, while fewer units completed than students participating must be recorded as a *loss*. Pay, bonuses, and taxes may be simulated as described later.



PT boat for production project

Following is a sample unit which has been effectively used in seventh-grade woodwork. The PT boat was presented to the class along with several other ideas. That the class chose the PT boat reflects the active, adventure seeking mind of the modern juvenile. Interest was apparent immediately, since the choice was theirs. The cost of this project was practically negligible since scraps normally wasted were used for most of the small parts.

The following check list for the instruc-



tor was prepared for the PT boat project, but it may easily be adapted to others.

INSTRUCTOR CHECK LIST
PT Boat Production Project

1. Duplicate plans as for any other class project. With these plans in the hands of the students, discuss needed organization.

2. Elect leaders:

Jobs

Plant Superintendent:

1. Help teacher co-ordinate entire unit.

2. Make factory floor plan and flow chart for routing materials and supplies.

Materials Expediter:

1. Prepare and distribute supply of basic materials for each department.

2. Expedite flow of parts along assembly line.

3. Together with superintendent, alert flying squad, or shift workers from one department to another to avert shortages or bottlenecks in production.

4. Help superintendent prepare flow chart showing routing of materials and parts within the plant.

Flying Squad:

1. Move from one job to another as needed to avert work stoppage.

Department Foremen:

a) Tool and patternmakers: (1) Make templates for all parts. Procure V block for holding round stock during drilling operations. (2) Make required jigs.

b) Layout: (1) Trace templates on stock for all parts. (2) Measure and mark lengths for cutting dowel rods. (3) Center punch or mark for drilled holes.

c) Large parts fabrication: (1) cut hull, upper and lower, on jig saw. (2) Tilt table of disk sander 5 deg. and sand bevel on edge of assembled hull. (3) Use miter guide on disk sander at 45 deg. and sand bevel on pilot house to simulate windshield.

d) Small parts fabrication: (1) Cut small parts as layout marks indicate.

e) Drilling: (1) Using V-block jig, drill gun mount hole in turret. (2) Drill for mast and mooring post.

f) Sanders: (1) Hand sand parts where needed.

g) Hull assembly: (1) Join upper and lower hull in jig No. 1 and drive finishing nails.

h) Small parts assembly: (1) Mount aft gun on hull using jig No. 2. (2) Mount gun in turret. (3) Mount turret in aft hull. (4) Mount fore cabin over hull and aft cabin. (5) Mount mast and mooring post.

i) Finishing: (1) Inspect, and retouch sanding where needed. (2) Paint.

j) Packaging, sales, and distribution: (1) Inspect finished product and package. (2) Make sales contacts and distribute.

k) Time-motion; cost accounting study (optional): (1) Time workers; suggest faster, labor saving methods. (2) Determine time spent in each department on each unit. Determine time total per unit for entire production. Report to class the proportionate "time-cost" chargeable to each department. Was labor supply divided among departments in proportion to cost? Would time-cost figures indicate that any one department cost more than it produced?

3. Tooling the factory. Usually some students are ahead of the group in individual project work. These pupils may be "hired" first to serve as tool and patternmakers. They may get materials ready, make necessary templates, patterns, and jigs, and even operate the factory in low gear until a few units are ready at each stage of the production line. Work ready at each stage, then, represents the factory as a worker would find it when starting his shift.

4. Start full scale production. Each worker should now be given a job instruction card. (Perhaps detailed descriptions enlarging on those given above. Foremen of each department, subject to approval of superintendent, should prepare the cards for his department.) Run the factory a pre-

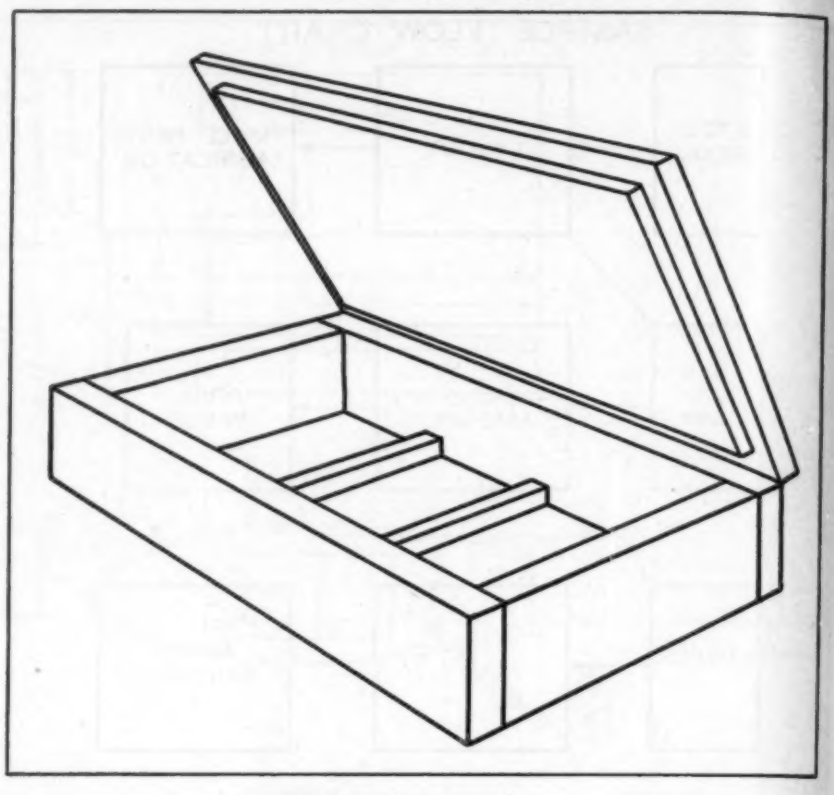
determined time. Combine jobs, or put more than one worker on a job, as size of class and flow of parts dictate.

5. Close down. To avoid waste and unfinished projects, reassign workers from beginning stages of production line to help finish the units as they come off the assembly line. As factory shuts down, discharge workers (unemployment) and allow them to return to individual projects.

6. Distribution and sale of product; pay of workers. It is suggested that each wage earner be paid one unit. One additional may be voted as bonus to outstanding workers. The teacher may demand several units to be held from the class as taxes and overhead. The remaining "profit" may actually be sold and the proceeds used for some class function if quality of product and school policy do not prohibit the practice. Or, local charities welcome such toys if contributed early enough for use in Christmas boxes. The class (board of directors) should make this decision.

The detail to which the plan can be carried will increase with the ability of the students. Even for older groups who have not tried this method, a simple first project will be more satisfying.

It is by now apparent that the scope and effectiveness of the factory or production project, as a variation in shop teaching technique, is limited only by the imagination and background of the instructor, and the initiative of his students!



Photographic paper box

PHOTOGRAPHIC PAPER SAFE BOX

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Chairman, Division Fine and Practical Arts
Georgia Teachers College
Collegeboro, Ga.

Photographic contact and enlarging paper may be purchased more economically in large quantities, but some provision must be made to prevent unnecessary waste caused through exposure by careless students.

The accompanying demonstration shows a photographic paper safe box designed to hold three contrasts of contact paper as large as No. 116 in the bottom and/or a quantity of 5 by 7 in. enlarging paper in the top. The cover overlaps the box by about ½ in. in front to facilitate raising it and the back is hinged. The entire box is finished with flat black paint to improve its safety features.

After a student has developed a roll of film he determines the contrast of contact paper he needs for his prints and advises his instructor who then removes the necessary quantity from the bulk packages in the darkroom and places it in a predetermined order in the bottom of the safe box. When the student is ready for the enlarging paper he proceeds as before in determining contrast, finish, etc. The instructor places the enlarging paper and a test strip in a predetermined order in the top part of the safe box. If more than one contrast of enlarging paper is to be used it is separated by the test strip and should cause no confusion.

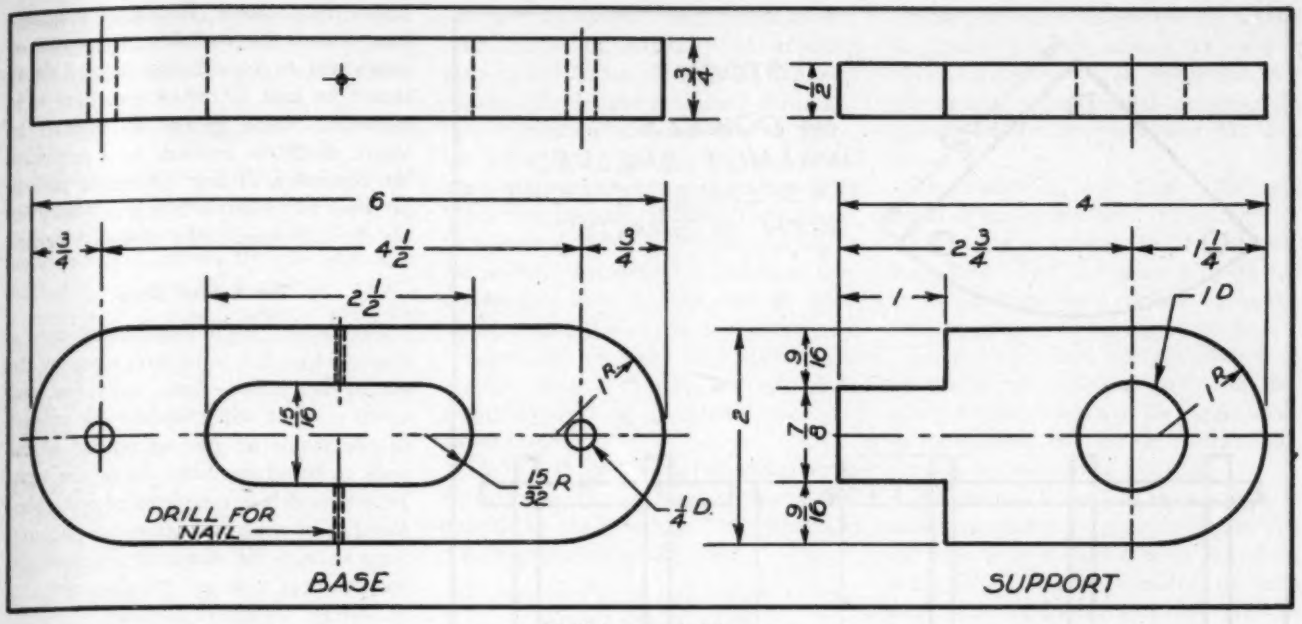
WALL BROOM HOLDER

ALFRED M. REINHOLD
Industrial-Arts Instructor
Atlanta, Ga.

The wall broom holder herewith described and illustrated is well within the ability of a woodshop student to make, and challenges him to work within fractional limits of an inch. It is easily constructed and yet embodies many instructional units; in fact, it can also be used as a test project at the end of the term and also as an *extra credit* project for the bright student.

The cost of the materials for this project is very small. It can be made from any straight-grained scrap wood, and it may be used as a

Wall broom holder



Wall broom holder

worth-while class or as an individual project.

By a lateral extension of the base and additional holder pieces, a series of broom holders can be constructed.

TOOLHOLDER

A. A. SINISI
Edison Vocational and Technical High School
Mount Vernon, N. Y.

The following describes a project which presents work that can be done on the shaper or milling machine.

Note the following points:

1. The dimensions given may be altered to suit the lathe tool post.
2. All operations may be performed on the shaper, milling machine, or lathe.
3. The usefulness of this project makes it a valuable tool for trainees or students of machine-shop work to own.

CORNER SHELF

WALLACE HAGLUND
International Falls, Minn.

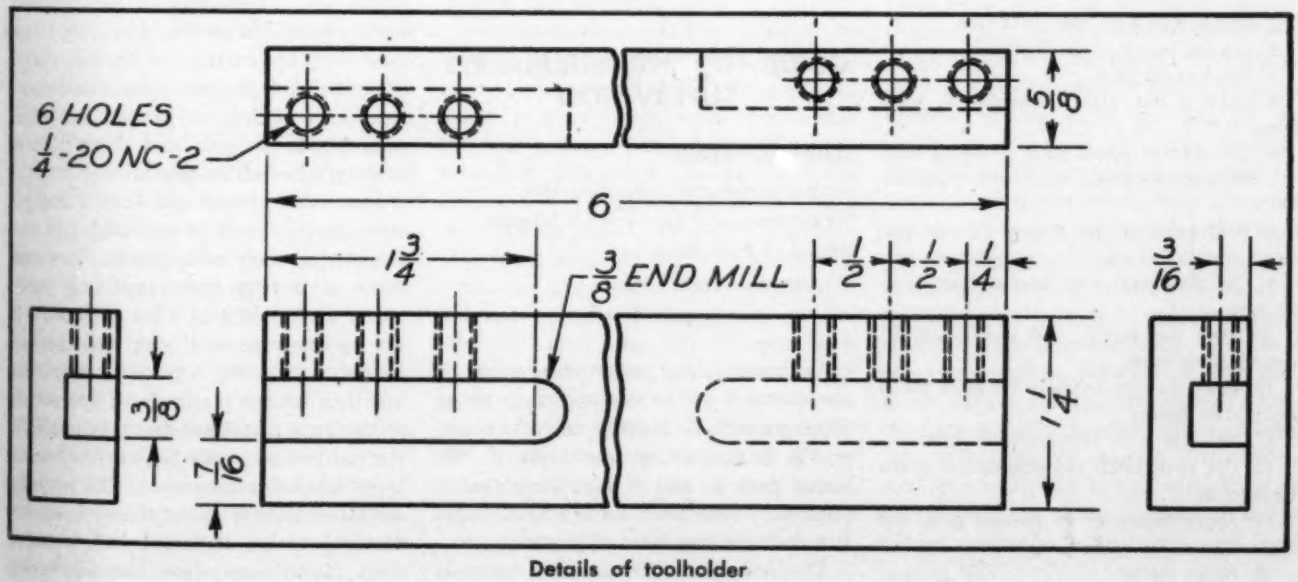
The article described herewith is a corner shelf that will make an excellent project for students who have but little knowledge of woodworking.

It presents the student with the following problems: how to square a board, how to measure with exactness, how to lay out a project, how to cut on a curved line, and how to stain wood.

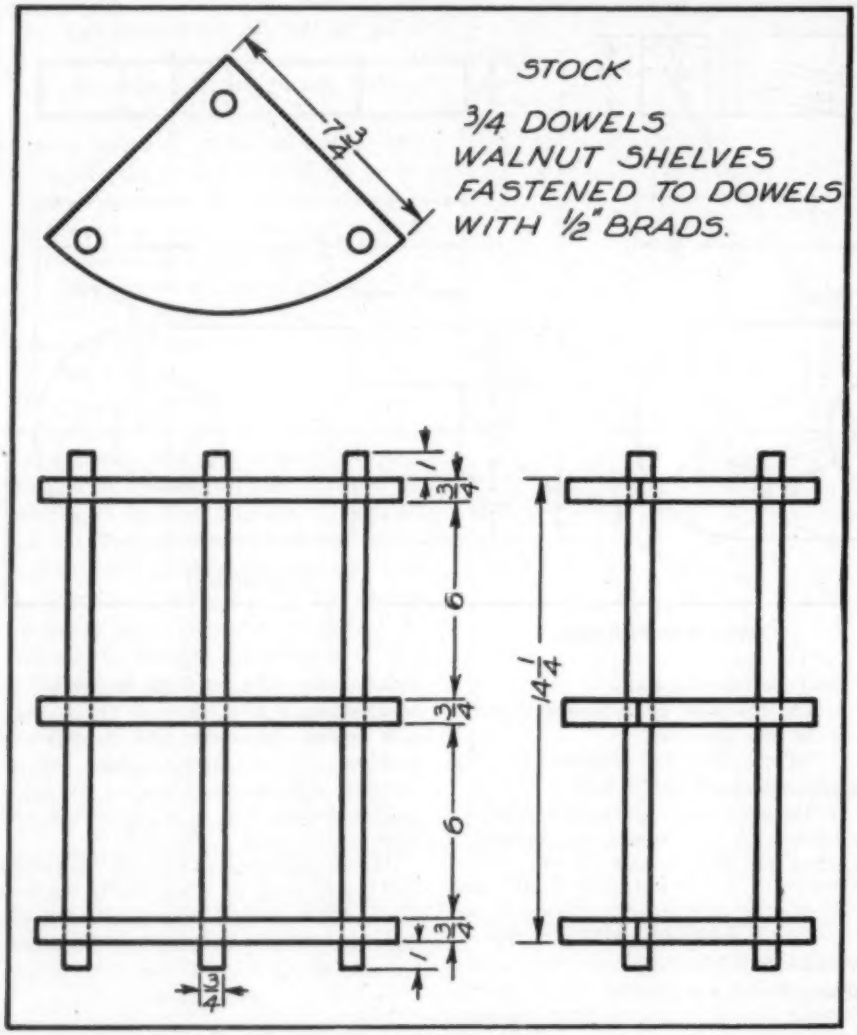
The material required to build this project is 3 pieces of ¾ by 8 by 8-in. walnut, and 3 pieces of ¾ by 16¼ birch dowel rod. If you use black walnut, its grain will add beauty to the shelves.

Procedure

1. Draw the necessary stock from the stock room.



Details of toolholder



Details of corner shelf

2. Measure off 8 in. from each side.
3. Cut the boards to the right size.
4. Square each piece.
5. Draw a line with a compass on each piece.
6. Cut out the pieces with a turning saw.
7. Remove the excess wood with a cabinet file.
8. Drill holes in the shelves for the uprights.
9. Cut the dowel rods into sections 16¼ in. long.
10. Sand the shelves and dowel rods to desired smoothness.
11. Place the dowel rods in the holes which are on the shelves.
12. Measure 6 in. between each shelf.
13. Use ½-in. brads and tack shelves to the dowel rods.
14. Apply linseed oil to the end grain and stain.
15. Apply shellac.

GUIDE FOR INDUSTRIAL-ARTS SUPERVISION

JOHN M. HURLEY
Acting Director of Industrial Arts
Elementary and Junior High Schools
Board of Education
City of New York

An unreasonably small shop group is uneconomical and an unusually large group places undesirable burdens upon the teacher who is attempting supervision of individual projects and of machinery that is potentially hazardous. Fifteen to 20 pupils is a desirable size for a shop group.

The practice of programming varies in junior high schools. Individual programming reduces the possibility of repetition or assignment to a particular shop. Records should be kept to reduce repetition to a minimum. Single periods 45 minutes in length should be avoided. As a minimum the equivalent of four 45-minute periods per week for industrial arts is necessary for the accomplishment of a desired program.

The School Shop

Decoration: Each shop should have a display of models or projects made by the teacher or pupils — basic, individual, and group — which will stimulate the interest of the pupils or give an outline of the work to be accomplished during the term. Besides models or completed projects, photographs of projects, appropriate pictures, maps showing the sources of raw materials, and charts of tools and processes may also be used for decorative purposes.

Orderliness: Organization is indicated in a systematic disposition of tools and materials, together with an established routine for their distribution and collection in connection with project construction. Tool racks for bits, chisels, files, and other small tools should be of the type that lends itself to a quick, accurate checkup at the end of the class period. All cutting tools should be sharp and in proper working order.

Cleanliness: Benches, floors, and supply closets should be cleaned periodically with a provision for salvage of usable material.

Safety: An adequate safety program should be in effect providing for periodical safety tests, safety posters, etc. The following obvious items should be given attention: unsafe storing of lumber, other materials and projects upon closet tops; hazardous placing of lumber and other materials in corners; and obstruction of working space of the pupils.

Shop Management and Pupil Participation: Pupils should be encouraged to participate in shop management. Responsibility is thereby encouraged and pupils secure a clear idea of what is involved in the various aspects of shop management. Pupils at times lag in project construction and their interest is stimulated by a service of this type. Provision should be made for the rotation of pupils through the various types of shop management. The following are types of pupil participation: Toolroom, material clerks, sanitary squad, inventory clerk, safety supervisor. Definite devices

should be used and posted to give recognition and publicity to students participating in the responsibility of shop management.

Projects

Individual and group projects, as well as basic projects, should be constructed by pupils. Individual projects permit of the development of individuality and initiative and give evidence of tendencies toward creative ability. Group projects give the opportunity for the development of such attitudes as leadership, teamwork, co-operation, and respect for the contributions of others.

A basic project is one upon which all or almost all pupils of a group are working at the same time to give meaning and a degree of facility in fundamental processes and operations. The number of basic projects should be so limited as not to interfere with construction by a pupil of at least one individual and one group project.

An individual project may involve the use of leisure time, home repair, or construction in the school shop in terms of job analysis or printed directions. The dictation (by the teacher) of a step by step construction of an individual project detracts from the values that inhere in the concept and proper construction of an individual project.

Teaching Plans

The teaching plan for a basic project should provide some sort of motivation — a preliminary discussion as to models, specifications, materials, and design. There should be some indication as to the tools to be employed and the steps to be followed. The plan likewise should give attention to related learnings in such subjects as English, mathematics, science, drawing, social studies, and other subjects of the curriculum. In addition there should be an indication as to stress to be placed upon such items of safety as are appropriate to the construction of the project.

This plan for a basic project will not necessarily coincide with any so-called weekly plan.

The teaching plan for the construction of individual projects should indicate whether the method of construction is by job analysis or in terms of printed instructions. If the method be job analysis the following items will be involved: an analysis of appearance and measurement; specifications of various parts including their measurements; the selection of needed materials, tools, and processes; sketching; the construction and assembly of parts; the finish, decoration, and appraisal of the completed project. If the construction be in terms of printed directions, there should be stress upon the pupil's understanding of the printed directions; the ability to read the working drawing; the need for additional information if the instructions are not clear; the necessary steps in constructing the project; checking the operations frequently; and the appraisal of the completed project.

The pupil's part in the planning of the construction of an individual project is one measure of the success of the democratic process prevailing in the shop.

Teaching Techniques

Demonstration lesson indicated in steps: (1) plan; (2) preparation (what do pupils already know); (3) presentation: by teacher, stressing most difficult points, by pupils, encourage questioning; (4) summary of steps by pupils; (5) careful checking by teacher, praise where it is deserved; (6) redemonstration as often as necessary.

Related information may be acquired by the pupil by consulting the shop, school, or public library. The teacher may offer this information informally or in mimeographed notes. Finally, related information may be formally developed through the medium of a shop talk.

The instructor should have a list of the topics of shop talks to be given during the entire term, as suggested in the course of study. A planned shop talk should take about 15 minutes. The following items are involved: (1) problem growing out of the construction of a project; (2) a few simple contributions made by the pupils as a result of previous assignment; (3) the addition of details by the teacher; (4) the use of illustrative material appropriate to the topic; (5) brief summary; (6) application to the orginal problem and to other appropriate situations.

Library: In addition to the supply of appropriate books in the school library there should be a library in each school shop. The shop library should be accessible to students and its use should not be unduly restricted. Records of its use are desirable.

Attention should be given to the variety of purposes involved, namely for securing related information, for suggestions for construction of individual projects, for research, and for facts concerned with shop talks.

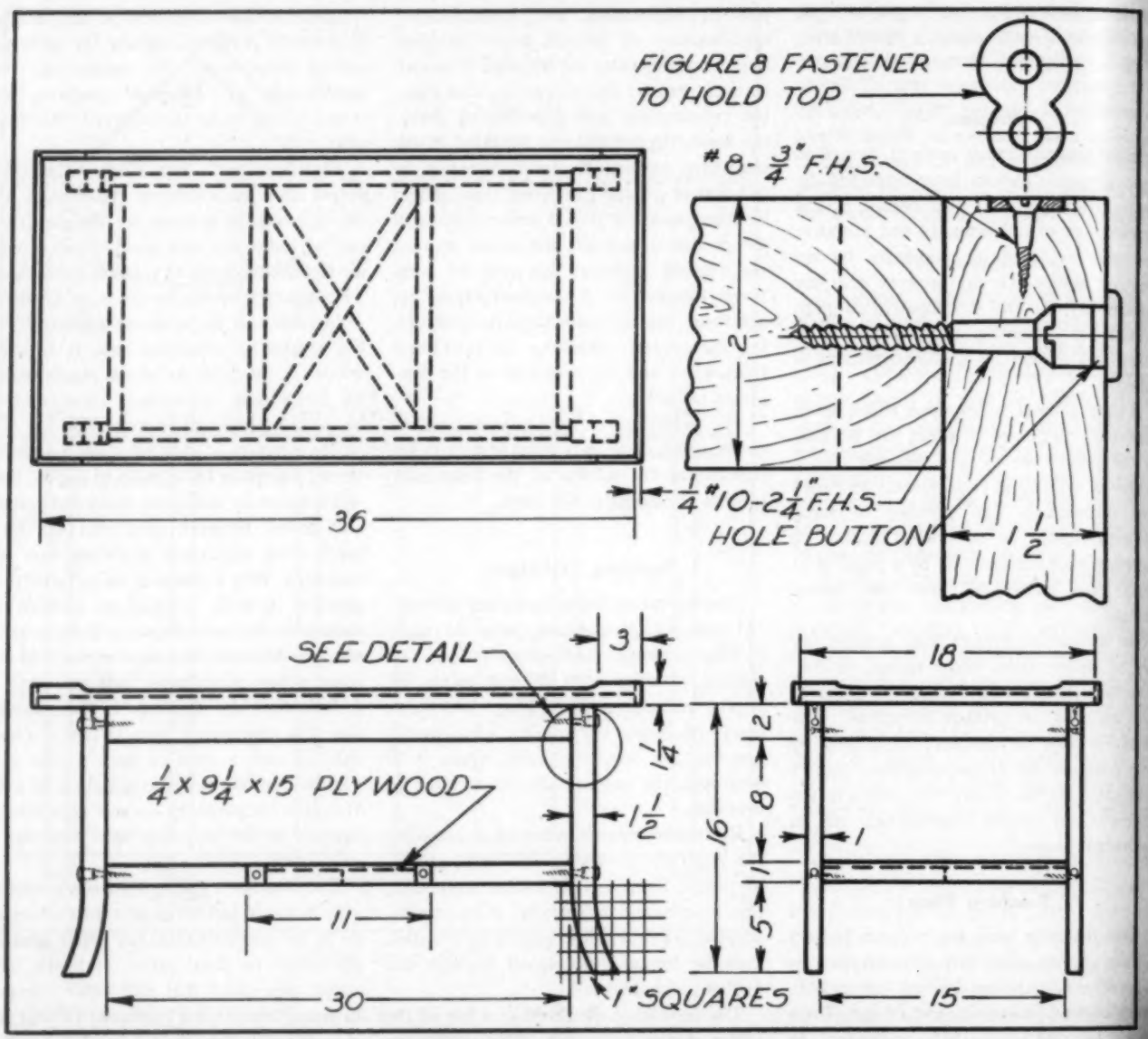
The Industrial Arts Club: The club period offers an additional opportunity for the extension of interest, for the construction of individual and group projects and for the enhancement of creative expression. This opportunity should not be overlooked.

Inventory of Pupil Accomplishment: If the teacher of industrial arts is to contribute to the guidance of the pupils under his instruction, appropriate records must be made by him and be available.

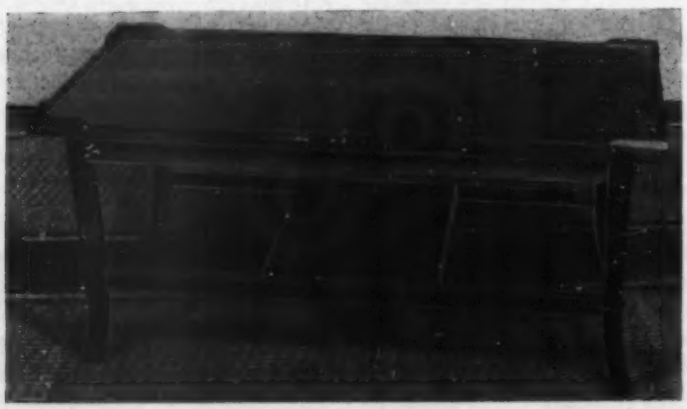
The division is working upon a type of record, adequate for a group of pupils, that will indicate by name, the basic, individual, and group projects completed by each pupil. The significant processes may be indicated, with a notation as to facility or promise in each. It may be possible to include in this record some indication as to the use of leisure time by the pupils in the construction of industrial-arts projects.

Industrial Art Exhibit: In this connection it is appropriate to state that a school exhibit, once a term or once a year is a culmination of the work in industrial arts. Its value for publicity and for sympathetic support of the industrial-arts program is unequaled.

The Teacher: The teacher is a considerable factor in industrial-arts instruction, as he is in instruction in any other area of education. He must gather authentic data about each pupil that will prove valuable in giving him helpful guidance. To that end it is desirable that the teacher be resourceful, zealous, enthusiastic, and alert to detect creative tendencies on the part of the pupils. These creative tendencies should be stimulated and an avenue provided for their extended expression. Such a teacher does not look upon the product as the most essential item, but considers industrial arts as developmental education. As a result of this point of view, he gives proper emphasis to all aspects that contribute to general education, such as, interrelation with academic subjects, stress upon related learnings, upon the background given through shop talks, upon the relation of the industrial-arts instruction to the expenditure of leisure time, and upon such items of safety as are necessary in the home and community life.



Coffee table submitted by Louis Barocci, High School, Cudahy, Wis.



Coffee table

PHOTOLITHOGRAPHY

SAMUEL VASIU
Fordson High School
Dearborn, Mich.

There are two principal methods of putting ink on paper. They are technically different in their operations. Their workers are organized into different unions. They form the bases of two entirely different industries. These methods are known as *Printing* and *Lithography* or *Offset*. Each has many different names. *Printing* is also called *Letterpress* or *Relief Printing* or *Type Printing*. *Litho-*

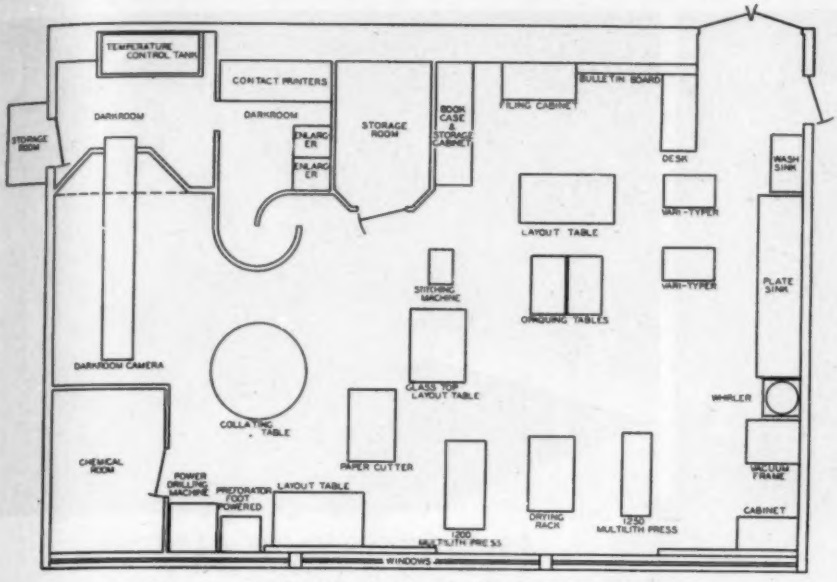


Fig. 1. Fordson High School offset printing shop

raphy is often called *Offset, Photo-Offset,* or *Photolithography.*

Printing is the method of taking an inked impression from a raised surface such as that on a typewriter bar or a piece of type. In printing, there are two kinds of raised surfaces, a piece of type, with which everyone is familiar; and a photoengraving.

The printing surface of a photoengraving is identical with the surface of a piece of type; that is to say, the matter to be printed is raised or in relief. An examination of a sample piece of type or photoengraving will show that the part to be reproduced is in relief, so that the ink is carried from the image to the paper by direct pressure of the paper against the raised surface of the type or photoengraving.

Now there are various developments in printing such as electrotypes which are metal duplicates of the original type of the photoengraving or both. But in all of these forms which are used on printing presses, the printing surface or image is raised. This permits the operation of the press by mechanical pressure. That is to say, the ink roller going over the type or photoengraving leaves ink only on the raised surface. When this surface is pressed against the paper, an inked impression remains on the paper.

Lithography or *Offset* differs fundamentally from printing in that the reproduction surface, that is the surface which carries the image, is a flat surface rather than a relief surface as in printing.

If you will look at a lithographic plate ready for the press, and run your finger over the plate, you will note that there is virtually no difference between the portions of the plate bearing an image to be reproduced, and the nonimage portions of the plate. This is exactly the opposite of type or photoengraving. It is

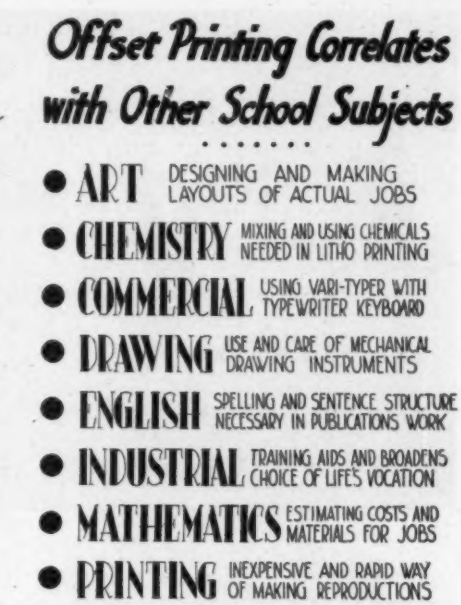

Offset Printing Correlates with Other School Subjects
ART DESIGNING AND MAKING LAYOUTS OF ACTUAL JOBS
CHEMISTRY MIXING AND USING CHEMICALS NEEDED IN LITHO PRINTING
COMMERCIAL USING VARI-TYPER WITH TYPEWRITER KEYBOARD
DRAWING USE AND CARE OF MECHANICAL DRAWING INSTRUMENTS
ENGLISH SPELLING AND SENTENCE STRUCTURE NECESSARY IN PUBLICATIONS WORK
INDUSTRIAL TRAINING AIDS AND BROADENS CHOICE OF LIFE'S VOCATION
MATHEMATICS ESTIMATING COSTS AND MATERIALS FOR JOBS
PRINTING INEXPENSIVE AND RAPID WAY OF MAKING REPRODUCTIONS
CITIZENSHIP RECOGNIZING THAT EACH PHASE OF WORK MUST BE ON A CO-OPERATIVE BASIS TO INSURE A SATISFACTORILY COMPLETED JOB

Fig. 3. Vari-Typer faces

Fig. 2. Chemical room

Fig. 4. Operating a Vari-Typer

Fig. 5

Fig. 6. Stripping line copy and half-tone copy on a single negative

opposite of type or photoengraving. It is this one plain characteristic of the lithographic plate used only on lithographic presses, which is the basis for the process and which, at the same time, makes it so completely different from printing.

Lithography is a chemical method of reproduction. A flat metal sheet of zinc or aluminum is used. First this plate is grained, which means that the smooth surface is roughened with abrasives which create a grain on the plate. This is not any ordinary grain, but is a very definite grain of specific size, depending upon the use to which the plate is to be put.

Lithographic plates are stored in dry-aired cabinets until they are needed. Then they are prepared by first etching the plate with a chemical solution to make it receptive to the image that will later be used for reproduction.

The Fordson High School offset printing shop, Figure 1, is equipped with a complete line of equipment for carrying out all phases of work necessary for completing a job. Our equipment, although on a small scale, is basically the same as that used in lithographic shops of larger sizes.

Lithography at Fordson High

Our shop consists of one room and incorporates the following equipment: For art and layout work we have four layout tables, three of which have opaque glass tops for viewing films. Our camera department consists of a 17–17 in. Robertson Darkroom Camera with a 100 line screen, two arc lamps and Douthitt lens control. In the darkroom we have a refrigeration unit with temperature controlled tank for storing the developing films. The camera has controls for operating it inside or outside of the darkroom. Our plate making department consists of a lead lined sink for washing plates. A medium size whirler for applying the sensitizer to the plates and a sufficiently large vacuum frame for

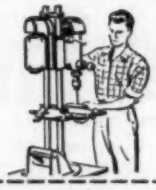
(Continued on page 18A)

Fig. 7

Fig. 8

SHOPSMITH . . .

key to the FLEXIBLE SHOP



Imagine a school shop so completely equipped that every student has the power tool he needs *when he needs it.* No waiting. No congestion. No danger-laden "hurry-up" pressure on students using power equipment. Think what such a shop could do for the enthusiasm of students, the peace of mind of instructors.

Imagine a shop so completely adaptable that it can be all lathes or all drill presses one period, and the next period a complete assortment of different power tools — *with changes requiring less than a minute per machine.* A shop that can be fitted quickly and easily to the progress and projects of any group, beginners or advanced.

Such a shop is the FLEXIBLE SHOP. And the one power tool that makes it possible and practical is SHOPSMITH. In each basic position — saw, sander, lathe, vertical or horizontal drill press—SHOPSMITH is essentially the same as a high-quality, single-purpose power tool, often outperforms that tool in accuracy, capacity, durability.

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PHOTOLITHOGRAPHY

(Continued from page 378)

burning in plates. We also have a rub-up table adjacent to it. We are using one 1200 Multilith press and one 1250 Multigraph which are capable of making reproductions at the rate of six thousand cylinder impressions an hour, on a maximum size 10 by 14 in. sheet. Incorporated in our layout department for copy preparation we also have two 20-in. Conventional Model Vari-Typers with justifiers. In our bindery department we have a footpower Boston stitcher, a power drilling machine, foot powered perforating machine, a Multiple foot powered punch with various sizes and shapes of dies and a 19-in. hand cutter. In one corner of the shop, glass enclosed, we have a chemical room for the purpose of mixing any necessary chemicals or sensitizers needed in carrying out lithographic work. Although all necessary chemicals used in lithographic reproduction can be obtained from commercial houses in prepared form, we, for the purpose of instruction, occassionally mix our own (Figure 2).

In order to illustrate the process further and clarify the principles of lithography, a typical job, such as we handle in offset printing shop, will be explained. A school publication is best suited to illustrate the steps necessary for completing a printing job by the offset method.

Layout and Design

"Lowrey Light," a school publication, is prepared by the students of the journalism class of that school and is sent to us in dummy form with illustrations, drawings, photographs, cartoons, and clippings; or any items they wish to include in their publication. Of course, it is necessary to set the dummy up according to a previous arranged form. Articles are typed in column form of approximate 3-in. width. The dummy is brought in on a Monday and returned completely folded on Thursday for distribution on Friday. We begin immediately upon receiving the dummy to justify the typed matter to fit a given 3-in. column according to instructions received in the dummy. This copy is prepared on the two Conventional Model Vari-Typers with automatic justifiers and interchangeable type faces. We find this machine very valuable in setting up copy because of its ability to justify each line, and more so, because of the variety of type faces that can be used with it. (Fig. 3). While the Vari-Typing is being done by girls from the commercial department who have selected the subject to supplement their course (Fig. 4), the boys in the offset department immediately rule out the forms for each page so that as soon as columns are finished they are pasted on sheets to be photographed later. All photographs and sketches of multiple tone prints are reduced to proper size and half-tone negatives are made of them.

Photographing

It is necessary to photograph continuous line copy and half-tone copy separately with a darkroom camera previously mentioned in this article and illustrated in Figures 4 and 5, then they are joined together, called stripping, on a single negative before the lithographic plate is made (Fig. 6). The Vari-Typing, the pasting up, and the photographing of individual parts are carried on simultaneously so that by the time the publication is fully justified, the only photographing remaining is the complete paste-up.

The next step, after the negatives are dried and they have been properly stripped into combination negatives consisting of both line copy and half tones, they are further improved by the opaquers who remove blemishes and tiny light areas and also make corrections when necessary.

(Continued on page 20A)

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from any angle.
By whatever standards you measure a lathe—bearings[1], capacity[2], gearing[3], apron[4], bed[5], power to spindle[6], accuracy[7]—whatever is important to you, you will find it completely satisfied in a SHELDON lathe.
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8 blade speeds
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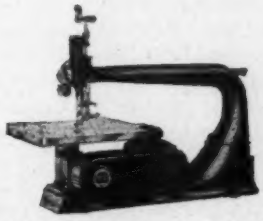
Knives 6" wide (3)
Knife guard provides ample protection.
Big tables—over 7" wide and 37½" long.
11,700 cuts per min., with 3450 r.p.m. motor.
Cutterhead is solid steel, ground and dynamically balanced.



JIG SAW 4 operating speeds. Patented blade tensioner makes possible rapid blade changing. Saw guide and hold down easily adjusted to all thicknesses of work. Throat capacity: 24"

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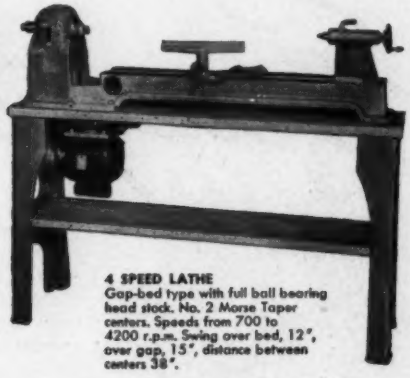
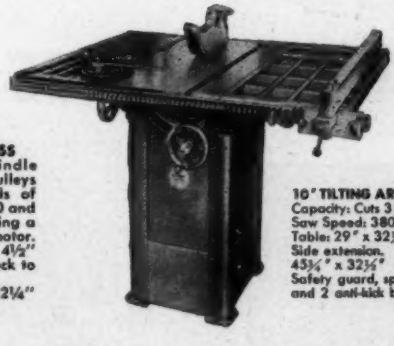


4 SPEED LATHE
Gap-bed type with full ball bearing head stock. No. 2 Morse Taper centers. Speeds from 700 to 4200 r.p.m. Swing over bed, 12", over gap, 15", distance between centers 38".

VERTICAL SPINDLE SHAPER
Complete cutter guarding for accelerated work speed. Belt and pulleys completely guarded. 3" vertical spindle travels on dovetailed ways. Two speeds: 7000 and 11,000 r.p.m.
Table: 22" x 33" — milled slot for miter gauge ¾" x 13/32".

DRILL PRESS
Four-step spindle and motor pulleys develop speeds of 600, 2130, 2440 and 5000 r.p.m. using a 1740 r.p.m. motor.
Spindle travel: 4½" — Distance chuck to column 7½".
Table: 10" x 12¼" machined top.



10" TILTING ARBOR SAW
Capacity: Cuts 3⅛" deep
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PHOTOLITHOGRAPHY

(Continued from page 18A)

Making the Plate

It is important, while this is going on, for the plate maker to prepare a plate by sensitizing it. The steps in sensitizing plates are simple, but each step must be followed with accuracy. In order to sensitize a plate it is first necessary to place the plate in a specially constructed sink, which is acid resistant. A spray of water is turned on the plate and with a stiff brush the surface is scrubbed forward and backward and sideways to remove any dirt adhering to its surface. This action must be maintained for about a minute. It is then placed in a solution of photo alum and nitric acid called counter etch. This solution is for desensitizing the surface and for helping to clean it more thoroughly. The desensitizing or the etching action is for the purpose of preparing the plate to receive the image. After a minute's time in the solution the plate is removed and again washed in running water. This time less vigorously but with strokes covering the entire plate. It is now ready to apply sensitizer to its surface. The sensitizer used has been previously prepared. It consists of egg albumen flakes or commercially prepared sensitizer can be used instead. It is important to keep the plate in running water while a given amount of sensitizer is measured out in a convenient container. The plate is then placed on a machine which whirls it at varying speeds. The whirling is set at slow speed for a few revolutions of the plate in order to whirl away excess water on the surface of the plate before the sensitizer can be applied. The sensitizer is then poured over the center of the plate while it is whirling at slow speed in order for the solution to spread evenly (Fig. 7). Now the speed is increased on the whirling machine and whirled until the plate is dry. It is necessary from now on to keep the plate in subdued light because as it dries it becomes more sensitive to light. When dry it is very much like a photographic plate.

Burning In

The previously prepared negative is now ready to place readable side up on the sensitized plate and then it is placed in a vacuum frame. This machine is a frame composed of a glass top and flexible rubber mat bottom with a means for extracting the air from between the rubber mat and the glass. It is by this method that a perfect contact between negative film and sensitized plate is made. The remaining portions of the plate are masked out or covered so that only parts of the negative exposed to the light are the transparent areas or the image. After this has been made secure in the vacuum frame and the air pumped out, an arc lamp is turned on for the proper exposure time.

Developing

The film is removed and the plate is developed by applying a black asphaltum developing ink, which is rubbed on the entire surface, until dry. The plate is next put under running water, luke warm preferably, and swabbed with a wad of cotton, which removes the unexposed sensitizer and developing ink leaving only the image that can be seen. Where half tones appear on the plate it is sometimes necessary to use a solution of sodium bicarbonate to aid in cleaning out the fine dots. A gum arabic solution is applied to the surface of the plate after the developing ink and sensitizer has been cleaned off the plate. The purpose of this gum solution is to preserve the plate so that it can be used in the future and also to protect the background which still has the ability of

(Continued on page 23A)

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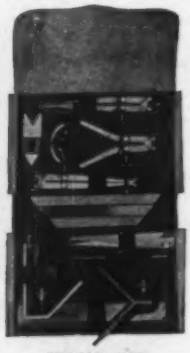
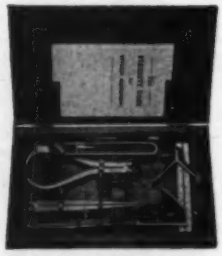


SET NO. 900

The basic tools at minimum cost. Contains 6" combination square complete, 6" flexible steel rule, center gage, center punch, 4" divider, 4" inside caliper, 4" outside caliper and 4" hermaphrodite caliper. Simulated leather folding case.



SET NO. 901

A practical economical "package" — contains 6" combination square complete, 6" flexible steel rule in leather case, center gage, center punch, 5" divider, 6" outside caliper and 6" inside caliper *plus* The Starrett Book for Student Machinists — all in a sturdy, compact, nicely finished wood case.

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MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
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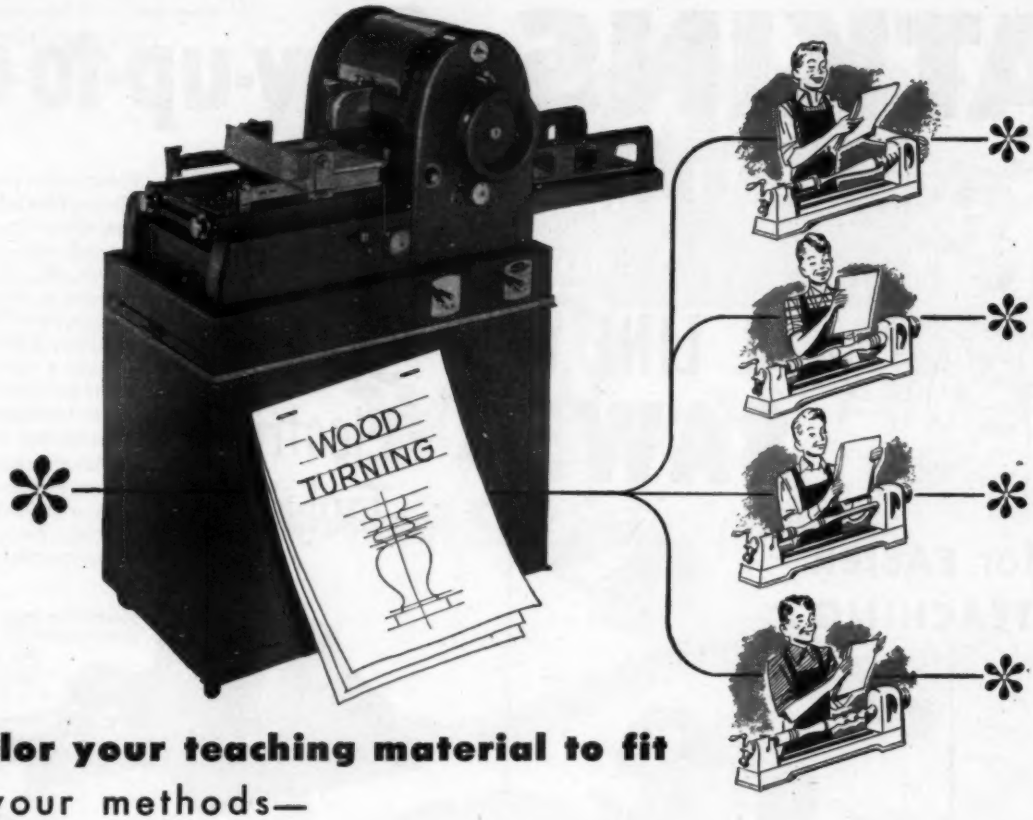
HACKSAWS, BAND SAWS and BAND KNIVES



tailor your teaching material to fit

your methods—
your students—
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First you develop exactly the teaching material you need to fit your methods and circumstances. Then you simply mimeograph enough sight-saving black-on-white copies to give every student a personal copy.

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The complete line of A. B. Dick precision drawing instruments for stencils will make your work easier and more effective. The new illuminated drawing board gives you all the accuracy of a drafting board. There's a new, wider line of mimeograph styli, lettering guides and shading screen plates plus a complete line of stencils designed to meet every need. For complete information, phone your local A. B. Dick distributor or mail the coupon below.

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School.....

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for EASIER TEACHING

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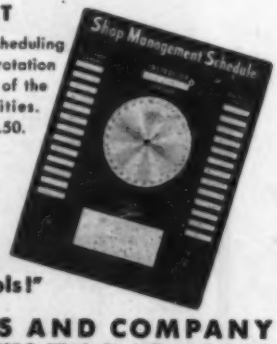
To make student job scheduling easier, use this duty rotation chart, which covers all of the principal shop activities. Order today — just $2.50.



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Equip now with STANLEY Electric Tools

Present-day emphasis on greater efficiency in industry is especially important to you in planning your manual arts training program. Above all, it means thorough training in the complete range of modern power tools.

Stanley Electric Tools, with the important features that industry wants and needs, are the practical choice for training America's new generation of tool users.

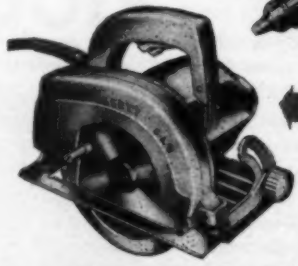
Make sure your shop facilities are up with the times. Equip now with a full selection of Stanley Electric Tools. Send coupon for complete catalog.

ROUTERS

high speed for precision work. Four models from ⅛ to 2 h.p. No. 28 shown, ½ h.p.

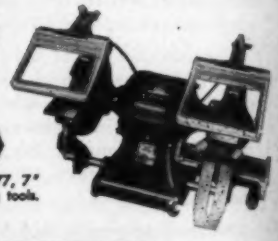
available in 23 models in capacities to 1¼". No. 24 shown, ¼" capacity.

DRILLS



SAWS

four sizes, 6", 7", 8", and 9". Many exclusive features. No. W65 shown, 6" blade.



BENCH GRINDERS

six models in sizes to 10". No. 677, 7" wheels, shown. Ideal for sharpening tools.

UNISHEARS

10 models. Cut sheet metal to 6 gauge. No. U218 shown, cuts 18 gauge.

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HARDWARE • TOOLS • ELECTRIC TOOLS • STEEL STRAPPING • STEEL

PHOTOLITHOGRAPHY

(Continued from page 20A)

attracting grease and dirt. The plate is now ready for the press (Fig. 7).

The Press

A lithographic press is somewhat different than a letterpress. A lithographic press is usually a cylinder type press and usually has three cylinders (Fig. 9): the plate cylinder, the blanket cylinder, and the impression cylinder. The fact that a thin metal plate is easily fastened to a cylinder makes high speed reproduction possible. In order to insure the best type of image it is necessary to maintain a balance between the water and ink combination. A good pressman will produce excellent copies if the proper pressure, water, and ink, are carefully maintained. The 1250 model Multigraph is possibly one of the smallest offset presses made. It will take a maximum of 10 by 14 size sheet. To carry on the process mentioned earlier in this article, the plate which has been prepared and ready for the press, is placed in proper position on the plate cylinder and the pressure adjusted to conform with the type of stock used. Next it is necessary to place the stock in feeder end of the press. The air adjustment for the blower and the suction is next adjusted. Next it is necessary to remove the gum coating with a wad of cotton from the surface of the plate by using a prepared solution for this purpose. The cylinder is turned by hand and wiped off with this solution making it ready for the inked impression. The press is then turned on at a slow speed letting it run for a few revolutions, then the water or fountain rollers are lowered on the plate. While the press is still running the ink rollers are engaged, so by this time there is a film of water and ink covering the plate. However, the water will adhere to the background of the plate and the ink will adhere only to the image. Next it is necessary to turn on the air for the feeder and apply the pressure to the cylinder causing the first impression as the paper runs through. It may be necessary to make other adjustments depending on where the image is to appear on the sheet and after these have been made the counter is set at zero for the beginning of the run. After all adjustments have been made the press can be speeded up to proper speed for best results. The printed matter is set in the drying rack to dry before it is sent to the binders for final work.

(Continued on next page)

Train them NOW to be
SAFE WORKERS LATER
with
WILLSON®
Personal Safety Equipment

STYLE
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CUP GOGGLES

- For heavy duty service—chipping, grinding, snagging
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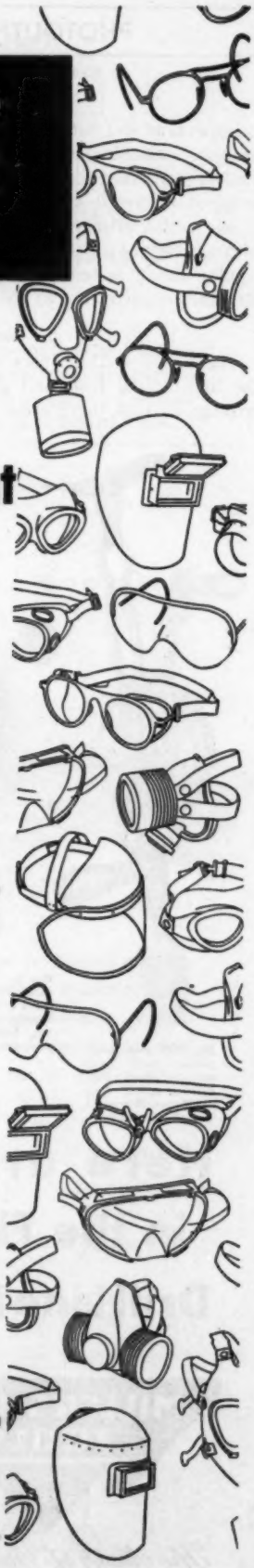
WILLSON eye and respiratory safety devices are distributed to schools by

Brodhead-Garrett Co.
CLEVELAND, OHIO
See their Catalog for further information
WILLSON PRODUCTS, INC., 216 Washington St., Reading, Pa.



PHOTOLITHOGRAPHY

(Continued from previous page)

Bindery

Inspection and bindery work such as drilling, stapling, wrapping, stitching, assembling, folding, etc., is done in the bindery department. The job is completed only when it is wrapped, delivered, and signed for. The bindery department is one section of our offset shop that can be kept humming with activity at all times. We are not only kept busy with regular instructioned jobs, but we bind lesson materials for other departments as they are needed.

Results

The entire course offers a tremendous opportunity for the high school boys and girls for a future in a rapidly growing part of the graphic arts. It is with this in mind, as you will note later on the chart, that the students are required to take three periods per day during their eleventh and twelfth grades. This enables them to get a well-rounded education on theory as well as practice. I can say with great pride that in the past seven or eight years we were able to place all of our graduates from this department in jobs directly or indirectly related to lithography.

Fig. 9. Lithographic press

PROGRAM OF STUDIES FOR OFFSET PRINTING

	B 10th Grade		A	
	Course No.	Periods Per Wk.	Course No.	Periods Per Wk.
Offset Ptg.	1	5	2	5
Drawing	1	5	2	5
Mathematics	1	5	2	5
English	3	5	4	5
Health	1	5	2	5
	B 11th Grade		**A**	
	Course No.	Periods Per Wk.	Course No.	Periods Per Wk.
Offset Ptg.	3	15	4	15
Drawing		5	3	5
U. S. History	1	5	2	5
English	5	5		5
Health	1	5	2	5
	B 12th Grade		**A**	
	Course No.	Periods Per Wk.	Course No.	Periods Per Wk.
Offset Ptg.	5	15	6	15
Rel. Science	1	5	2	5
Civics	1	5		
English			8	5

Tenth Grade

In the 10B grade information consisting of history and background to lithography gradually leading to present-day discoveries and applications. Some practical experience in the bindery, padding, collating, gathering, numbering, trimming, and starting off on accumulating.

Sample and workbook. The students are required to keep these books up by adding to them from time to time indicating along with a sample of the job what particular work they did on it and when. The 10B's acquire general knowl-

(Continued on page 26A)

No. 118—two-speed breast drill with built-in level. Perfect for school-shop use. Extensible crank • ball-bearings.

No. 2 — One of the most popular hand drills ever designed. Sturdy, smooth-acting, built for lifetime performance.

No. 104—newest addition to the Millers Falls line. Enclosed gears, "Oilite" spindle bearing—unbreakable, glossy red "Tenite" handles.

No. 183A—formerly the world-famous "Mr. Punch"—now even better with a new, quick-acting, positive-lock chuck.

No. 100 — a beautiful new tool with all the time-tested features that have made Millers Falls Automatic Drills such favorites.

Here are the Leaders in the Finest Drill Line Made

MILLERS FALLS TOOLS SINCE 1868

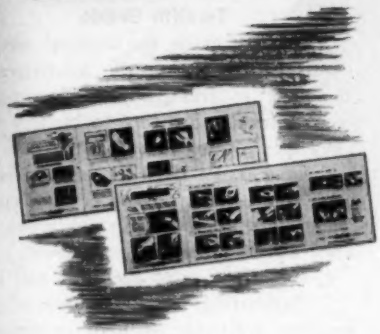
The Mark of Superiority

For the better part of a century, craftsmen the world over have known and respected Millers Falls famous line of drills. Shown above are the five top stars in this all-star line. Each is an ideal tool for your school shop . . . a tool that brings out the best work your students can do. Each is ruggedly built to assure long-lived performance under punishing school shop use. Next time you order drills — insist on Millers Falls. You'll get the finest values money can buy.

MILLERS FALLS COMPANY • GREENFIELD, MASS.

INSTRUCTION AIDS

HOW MANY OF YOUR PUPILS KNOW THE REASON FOR DROP FORGING — AND WHAT IT DOES TO IMPART TOUGHNESS TO THE TOOL?



Yours for classroom or other group use without cost or obligation. This is not mere propaganda material but, rather, instruction aids that are packed with information and will instill a proper respect for *quality* tools—how to use and care for them. Printed matter (A, B and C) is provided loose in handy portfolio.

WALL CHARTS

Approx. 32" x 12"

(A) "HOW TO USE PLIERS" — Pictorial explanation of how to hold pliers, how to choose right pliers for the job, how to avoid breakage, etc.

(B) "WHY DROP FORGED TOOLS LAST LONGER" — Pictorial and diagrammatic explanation of effect of drop forging on steel fibre structure—and of the application of electronic induction hardening to parts of the tools subject to excessive wear.

BOOKLET

8 pages

(C) "FIRST AID FOR PLIERS"—Prepared primarily for industrial firms to alleviate tool shortage by repair. Useful to shop teachers (and advanced pupils) for making worn or damaged pliers usable. Contains diagrams and detailed instructions.

SOUND MOVIES

Each a complete 10 minute showing. (User is asked to pay cost of return shipment)

(D) "ADD POWER TO YOUR HANDS"—Shows making of drop forged pliers. Authentic in-the-factory shots under actual working conditions. Covers forging, hardening, finishing.

(E) "PLIERS: THEIR CARE AND USES"— Demonstrates proper care and use, selection of right types, simple repairs.

This material is provided by Utica as a public service—to speed America's industrial progress—to promote an understanding of drop forging and induction hardening and to instill a proper appreciation for all quality tools.

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(or organization)

STREET_____

CITY_____ (ZONE)_____ STATE_____

Require movie film (or films) on following date:_____

PHOTOLITHOGRAPHY

(Continued from page 24A)

edge by aiding in work done by the upper classmen and the more advanced students. The 10A grade students continue with work done in the 10B grade but have an opportunity to take greater part in the shop activities helping in the darkroom, and aiding with plate making and operating the press. Meanwhile, they are given lesson sheets on various phases of work in lithography.

Eleventh Grade

Although, the entire course is arranged so that each student may continue from semester to semester adding more theoretical and practical knowledge, he will eventually fall into a phase of work that will appeal to him most. It is with this in mind, beginning in the 11B grade, that they are encouraged to specialize in some field of lithographic work. It is here, also, that arrangements are made for the offset student to take one period a day of regular printing. This offers a splendid opportunity to understand the graphic arts in general. Continuing into the 11A, we do not lose sight of the fact that lessons and lectures are important and must be supplemented by actual practice. As they advance, the responsibilities of carrying a job to its completion become greater. In this grade the students touch upon all the phases of lithography, but must gain more experience before they take on the more difficult jobs in the shop.

Twelfth Grade

In the 12B grade the students are given intensified lessons on the mechanics and chemistry of lithography. They prepare the job from estimating to bindery work. They are responsible for the job until completed. From the 12B through the 12A the students take charge of all phases of lithography as offered in our offset class. They cover the following outline:

1. Organization of the shop and safety
2. Estimating, figuring amount of paper, supplies, and time required in completing the job
3. Art work and layout planning
4. Photographing of line and half-tone copy
5. Stripping and opaquing of films
6. Sensitizing and developing of lithographic plates
7. Operating and care of the presses
8. Responsibilities of the bindery department
9. Comparisons of furnished jobs in relation to the other forms of printing
10. Field trips to lithographic plants as well as other printing shops

Varityping

Varityping, as stated before, is an integral part of our offset shop since it plays an important part in copy preparation. It offers opportunities to girls and boys from the commercial department who wish to specialize in this type of work. Varitypists are in great demand and since our two machines are located in our offset shop it gives these students a better opportunity in seeing their work put to practical use.

The opportunities in the field of lithography are great and it is with great satisfaction on my part to say that the students who choose offset printing for a career stand an excellent chance for success.

Reimbursement is not what makes a course vocational.

If something must be taught to help a student better his occupational status, that course is vocational — whether it is reimbursable or not. — *Arthur L. Reagh*

Here's a tool that really shaves your tool budget expenses...

And the reason? Never before, at a popular price, have you been able to buy such a quality blade in a professional plane.

Specify this SARGENT HERCULES PLANE, because it has 12 certified advantages, including:

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Prices subject to change without notice. Consult your dealer.

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unquestionably the best machine for teaching standard wood planing practice

CAP. 20 x 8

Judge for yourself. It is the only planer in the low-cost field that is adjusted and operated similarly to the large standard machines used in industry . . . the only planer in this class that is equipped with a sectional infeed roll, sectional chipbreaker and four driven rolls — permitting the planing of pieces of varying thickness without the danger of kick-back. It's also the only small planer with in-built knife grinder and other big planer features. The grinder permits the instructor to grind the knives and joint them in just a few minutes. This saves much of his time and tends to eliminate the dull knife condition which so frequently prevents the student from doing good work. The frame is now a heavy one-piece semi-steel casting for great rigidity and strength. All driving mechanism and electrical wiring is fully enclosed, engineered for maximum safety. Judged from any angle the No. 208 is the best possible selection for the school shop and the price is well within the means of the average school budget. Write for the complete facts.

BUSS MACHINE WORKS 246 EIGHTH ST., HOLLAND, MICHIGAN

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For Industrial Arts and Vocational Training

. . . are designed and constructed to give maximum utility and long service under hard usage.

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. . . are pictured and described in a new Catalog Sheet, entitled "Sjöström Work Benches".

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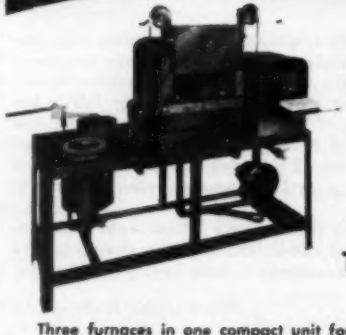

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ENGLISH FOR TRADE AND VOCATIONAL SCHOOLS

J. ALLEN MORRIS
Murray Vocational School
Charleston, S. C.

(See preceding articles in January, September, and November, 1948; May, June, November, and December, 1949; February and November, 1950; and February, March, and June, 1951, issues)

How to Improve the Style of Themes and Written Work

1. Start many sentences with clauses starting with words like *when, because, if, after, while, since, unless, before.*
2. Try to use a few semicolons on each page (one or two to a page).
3. Do not use many compound sentences joined together by *and* or *but.*
4. Change some of the compound sentences to simple sentences by dropping the subject of the second sentence and the comma: *Example:* John bought another sailboat, and he entered it in the race. *Better:* John bought another sailboat and entered it in the race.
5. Start a few sentences with prepositional phrases: *Example: In the auto shop* many cars are repaired each year. *Example: After several hours* the robbers were captured.
6. Occasionally use a few simple sentences to speed up the style.
7. If possible, work in a question every now and then.
8. Try not to start sentences with *and, but, so,* and *then.*

This abbreviated suggestion sheet is not expected to produce either immediate or permanent results; it is used in conjunction with a series of practice drills on avoiding too many simple sentences, too many compound sentences starting with subjects and verbs. The additional drills are further strengthened by extra drill sheets on punctuation of different types of sentences, so that the students gradually acquire a feeling for sentence variety in all written work.

In addition to themes on general subjects and on shop subjects I use a number of mimeographed sheets to add variety, to encourage outside reading and the use of reference books, and to furnish some theme subjects that even the slowest, dullest, and least academic students can handle fairly well. There is no limit to the usefulness of these sheets, for they can be used again and again, in class and for homework.

One is used as a simple outline for a short theme on a story or article read by the student. He is encouraged to select the reading matter to suit his own tastes; then he turns in a report for credit, basing his paragraphing on the following:

(Continued on next page)

THE SAW THAT WAS DESIGNED WITH THE SCHOOL SHOP IN MIND

FOR 40 YEARS · BOICE CRANE · AMERICA'S MOST IMITATED POWER TOOLS

THE BOICE-CRANE 14" BAND SAW

VERSATILITY . . . cuts, sands, files, grinds any material . . . accurately . . . smoothly.

SPEED . . . 2 to 4 times faster. Blade speeds up to 4,400 f.p.m. at 1200 r.p.m. Vibrationless. Single and 8-speed models.

CAPACITY . . . blade to guard, 13½", 27" dia. work. Guide to worktable, 8⅝". Blade widths: 3/16", ¼", ⅜", ½", ¾". Blade length: 98".

SAFETY . . . wheels and blade entirely enclosed, except at cutting point. Blade guides safely adjusted by single control, even when running.

SIZE . . . over-all height of floor model: 67". 15" x 15½" table tilts on double trunnions. Sealed-off motor compartment in cabinet base.

STURDINESS . . . strong, one-piece, welded steel frame. Strong light, molded Textolite wheels; dia.: 14"; face, 1". Long-life, grease-sealed ball bearings.

Mail coupon now for details and prices on
12 MODELS Single and 8-Speed Backgeared

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ARE "CHEAP" POWER TOOLS CHEAP
When You Sacrifice Capacity and Accuracy?

Boice-Crane tools cost only slightly more than less accurate, limited capacity machines — actually cost less because they serve better and last longer! Remember this when you buy a jig saw.

Only Boice-Crane

HEAVY DUTY 24" JIG SAWS Give You All These Advantages!

- Cuts materials up to 5 inches thick.
- Wider range tensioner guarantees a square face cut with any blade 1/16" to ½" wide and 5" to 9" long.
- Super-strength drive, extra capacity and versatility.
- 1½" blade stroke — 50% longer.

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Oversize, precision ground, cast iron work table (20" x 20") has two-way tilt to 45°. Splash lubricated moving parts and ball-bearing crankshaft. Overall: 39" high, 20" wide, 38" deep.

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Name.....
Street.....
City.....State.....

ENGLISH

(Continued from previous page)

Condensing Material

1. Tell what you read: the name of the story, article, or book.
2. Tell why you selected that particular story, article, or book to read.
3. Retell briefly the story or plot — or tell something about what you read: a few facts, details, or incidents.
4. Express your honest opinion of what you read. Tell why you liked (or did not like) it, and give several reasons for liking (or disliking) it.
5. Tell why you would (or would not) like to read another story, article, or book by the same author.

Write a theme based on your reading, using the directions above.

Write complete sentences, and punctuate them as well as you can.

On the same mimeographed sheet is the following:

Movie Comment

Use *A*, *B*, or *C*:

A. Write a theme based on a picture you have seen in school, using the following suggestions:
   1. Name some of the kinds of pictures shown in school.
   2. Write your honest opinion of them. If you do not like some kinds of pictures, say so — and tell why you dislike them.
   3. Suggest, if you can, some changes that can be made to improve the picture situation in school.
   4. Describe the kinds of pictures you like best. Tell why you like these kinds of pictures.

B. Select some one picture you have seen in school, and tell what you remember about it, how you liked it, why, etc.

C. For a picture that you have seen in a regular theater (not in school), use the following list:
   1. Tell when and where you saw it.
   2. Retell in a few sentences the plot of the picture.
   3. Name the main characters in the picture.
   4. If you have any favorite actor (or actress), give name(s) and reasons for liking him (her).
   5. Express briefly your honest opinion of the picture. Tell why you liked or did not like it.

This is self-explanatory, easy to use, and almost always produces a good theme.

A boy who is seriously interested in shop-work finds the following suggestions helpful:

Shop Job

As this theme should be long and detailed, select some job which you remember as one of the most interesting or one of the hardest you have done since school started this year.

Be sure that you try to include all the following:

When? (When did you do the work? How long did the job take?)
Where? (Where did you do the work?)
Who? (Who assigned the job to you? Who worked on it with you?)
How? (How did you do the job? Describe your work step by step, from start to finish.)
What? (What did you do? What tools, machines, instruments, materials, etc., did you use? Give facts and figures. Use as many technical terms as possible.)
Why? (Why was the work necessary? Why were you assigned to it?)

NOTES: These questions are just suggestions — guides to help you to think of things that you should include in your theme.

In organizing your theme, do not attempt merely to answer the questions. If you do, the result will be unsatisfactory and will be returned to you for revision and rewriting. Instead, decide what you want to say; then arrange your material in correct paragraphs.

This theme should be made up of a number of paragraphs; it should be several pages in length.

Another type of theme that most boys find easy is the *Reference Reading Report*. This suggests the names of prominent figures in American history (Washington, Jefferson, Franklin, Lincoln, Lee) and furnishes a simple outline for a biographical theme based on an article in a modern encyclopedia; for example:

(Continued on page 32A)

NEW!
Packaged Metallic Rectifiers
Supplement Your M-G Power Supply

5-kw Selenium Rectifier Power-Conversion Unit

Permits Study of Rectifier Characteristics

These Rectifiers will enable your students to perform experiments that will familiarize them with the characteristics of this modern power-conversion unit.

Static metallic rectifiers are receiving wide recognition in industry due to the inherent advantages of low installation cost, high efficiency and good regulation.

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3ϕ, full-wave selenium rectifier stacks
Insulated delta-wye transformer
Three-pole a-c contactor with thermal overload protection
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Electrical Characteristics:

Efficiency: between 81 and 85%
Regulation: between 8 and 13%
Power factor: 95% or better
Ripple: about 4%

Ratings and Ranges:

Input: 208, 230, 460 volts, 3ϕ, 60 cycle
Output: 125 or 250 volt d-c, 0.75 to 25 kw.

Write for fully illustrated Bulletin GEA-5658, containing wiring diagrams, performance curves, and application information to: General Electric Company, Sect. A687-72, Schenectady, N. Y.

687-72

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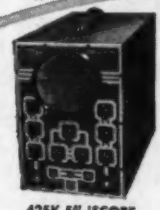

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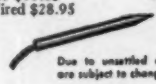

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School.....

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ENGLISH

(Continued from page 30A)

Robert E. Lee

(*a*) Date of birth, (*b*) place of birth, (*c*) education, (*d*) attitude toward slavery, (*e*) political offices held, (*f*) activities in War Between the States, (*g*) date of death.

The same paper also suggests the names of men prominent in trade fields; for example, in the electrical field, Faraday, Ohm, Watt, and Edison. The student is free to choose a name for himself if he wishes, provided the person chosen is of sufficient importance to be written up in an encyclopedia.

In the second and third years, themes on subjects in traffic safety and United States history are correlated with the English work, and in the senior year themes based on United States citizenship are also correlated with the English work of the seniors. In the senior year a number of themes are required, the first of these being the following:

Autobiography

An "autobiography" is the story of one's life. Write a theme based on the events in your life up to the present time. Start with the date of your birth and bring it up to date, using as many of the following items as you wish:

1. Names of parents; some facts about them. 2. Date and place of birth. 3. Other members of your family, if any. 4. All the cities you have lived in and all the schools you have attended; comments about courses, teachers, activities, etc. 5. Your hobby — if you have one. 6. Jobs you have had or now have — or both. 7. Things you like and dislike. 8. Adventures, narrow escapes, interesting trips, clubs and organizations you belong to, sports you enjoy, etc. 9. Anything else (not included in this list) that you think should be mentioned about you. 10. Your ambition: future plans.

NOTE: These items are not arranged in any particular order. Rearrange the order of paragraphs in your theme to suit yourself.

Try to include some information about each of the items in the list, but omit any that do not apply to you or that you cannot or do not wish to write about.

The autobiography is followed by a book report. Any good book may be used for this, and the reading may be done at home or in school. The average student has little trouble with this, basing his theme on the following:

Book Report

Date of reading.....Name.....Class....
I have read ..... by .....
name of book *author's name*
I did (did not) like this book because . . .

Name the three most important people in the story and tell why each helps to make the story interesting to you.

Write a short paragraph, retelling the story in your own words. Try to tell enough about the story so that another boy could decide, after reading your paragraph, whether or not he would like to read the book.

Describe the scene you liked best in the book.

Tell whether or not you would like to read another book by the same author. Give reasons for your statement.

For the next senior theme ("The Interview") the student is referred to pages 165-166 of John T. Shuman's *English for Vocational Schools*, a valuable text for any vocational school's English classes. The senior is told to study the suggestions until he knows them, then to write a theme describing the preparations for an interview with a prospective employer, telling what to do and what not to do while being interviewed. This subject, of course, is obviously practical and valuable.

The next three themes are best handled as class jobs. The first, "What a Man Should Give to His Work," gives the students some idea of what an employer expects of his employees. The second, "What a Man Expects from His Work," enables students to form an opinion as to what a workman has a right to expect from his work and his employer. The third theme, "What . . . Work Gives to the World," helps the vocational school student to realize the social value of his work.

For each theme a period of class discussion

(Continued on page 34A)

modernize your machine shop now
install America's no. 1 machine tool drive . . .
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Above photo shows the installation of LIMA GEARSHIFT DRIVES at the Syracuse Vocational High School, Syracuse, New York, made during the recently completed machine shop modernization program.

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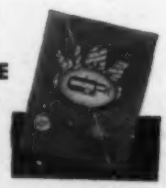

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BY M. J. RULEY. Contains thirty-five projects, all easy to make with ordinary shop equipment. A photograph, bill of material, procedure and suggested reading references are included with the presentation of each project. Includes: bottle openers, paper knife, small hammer, turner, towel rack, hose holder, garden trowel, jar opener, paper weight, scoop, match box, spice rack, tooth brush holder, dust pan, memo pad holder, picture frame, weeder, toasting fork, door knocker, flower pot holder, pin-up lamp, house marker, door grill, coping saw frame, soldering copper, and others. 80 pages, cloth cover. $2. Send for approval copy.

● Projects in Electricity

BY MERLE D. COLLINGS. Twenty-one inexpensive projects which demonstrate many basic electrical principles. Simplified construction through use of drawings and step-by-step instructions. Projects selected which arouse greatest student interest. No elaborate equipment or tools necessary. Photos of each completed project included. 80 pages. $1.20. Send for approval copy.

● Projects in Woodwork

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● Machine Shop Projects

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McKNIGHT McKNIGHT PUBLISHING COMPANY

Dept. 16-A, Market & Center Streets, Bloomington, Illinois

ENGLISH

(Continued from page 32A)

is desirable. The instructor should lead this discussion, writing on the board the various ideas suggested by students, adding to them from his own experience and knowledge of the business world, and organizing them into groups for correct paragraphing. These points should be copied by the students for later use. For absentees a list of ideas from board work can be typed or mimeographed and used as needed.

The first and third themes can be written by most students without much difficulty. In my school the second theme is used to teach the proper methods of organizing a theme:

1. The writer must know something about his subject. History texts and reference books supply information on the rise of the laboring classes, the formation and growth of labor unions, and the demands of labor in recent years.
2. After reading up on his subject, the writer prepares a list of things a workman has a right to expect from his work.
3. Using this list of ideas, he organizes his paragraphs. Most of the items in the list can be treated under the following headings: (*a*) the job itself, (*b*) physical conditions, (*c*) time, (*d*) money, (*e*) personal relationships.
4. He then writes a rough copy of his theme, checks it for mistakes, rewrites it neatly, and turns it in.

The final senior theme should be presented in the same way, introduced by a preliminary class discussion. The instructor should help his students considerably with this if he wishes to secure a satisfactory theme on the subject "Using Good Written English and Spoken English." As the discussion proceeds, students realize the value of English in after-school life.

In addition to themes already described, a few others are written from time to time, as local organizations conduct contests which students are invited to enter.

Each theme is carefully corrected, and the student is required to make all necessary corrections before receiving credit for his work. Spelling errors are underlined so that the student can find and correct them, using a dictionary; then he writes each word misspelled a number of times (3, 5, 10, 15, 25) according to the value and importance of the words missed. All important punctuation marks must be inserted, and capital letters must be properly used. Errors in tenses, number, subject-verb agreement, etc., are explained to the student, after which he makes the necessary corrections. If the theme should be rewritten, the student rewrites it neatly; then he receives credit for his work. Instruction and drill work follow the theme writing, based on the needs of the student as shown by the mistakes made in his theme.

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Provide for your school shop with the kind of lumber that will turn out the best projects . . . uniform, first quality materials properly graded to conform to current national grading rules. It's more economical in the long run, too, reducing waste and spoilage to a minimum. Paxton lumber and plywood are truly reliable.

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News Notes

♦ The Camera Club and School Service of the Eastman Kodak Company has prepared some interesting instructional material for classes in photography.

Chemical Project No. 1 shows how photographic film and paper are manufactured. The kit for this project consists of an 8 by 10-in. illustration showing how an instructive exhibit chart for the classroom may be arranged.

Materials for this chart consist of:

15 illustrations varying from 3½ by 4½ in., to 5¾ by 4½ in.

2 sheets black-and-white titles for illustrations and materials.

2 sheets commentaries on gray background for descriptive and discursive titles.

5 transparent pillboxes containing cotton linters, cellulose acetate, potassium bromide, gelatin, and silver nitrate (substitute).

1 sheet of safety film base.

4 strips of raw paper.

Besides the foregoing, there are four pages of questions and answers which may be used in a discussion on the subject of this project.

To secure this material, write to *Eastman Kodak Company, Rochester 4, N. Y.*

♦ Blacklight Fluorescent Chalk is the newest fluorescent product placed on the market by the Norco Products Manufacturing Company, manufacturers of Blacklight equipment and scientific instruments. The chalk is available in sets of six

(6) radiant fluorescent colors (blue-white, green, yellow, red, blue, and orange-red) which glow with a neon-like brilliance when activated by Blacklight. The chalk is easily erased with an ordinary board eraser or with a piece of cloth.

The use of this chalk when combined with an inexpensive Blacklight fixture, dramatizes and livens blackboard lectures and discussions.

For further details write to *Norco Products Mfg. Co., Dept. BLC, 392 Bleecker St., New York 14, N. Y.*

♦ A minor in industrial arts is becoming the educational equipment of many of the Catholic school sisters of Michigan.

During the past summer fifty of the nuns from various parts of the state assembled in Detroit for courses at Wayne University and Marygrove College. The classes were staffed by Dr. Harold Silvius, Charles Sechrest, C. Falik, and D. Zwickey. Dr. Silvius and Mr. Zwickey acted as advisers to the nuns participating in the project.

The drafting program of the Detroit Archdiocese, started in one school in 1946, has now spread into seventy schools in Michigan and neighboring states.

♦ A new 8-page bulletin entitled "'Surface' Heating and Heat Treating Furnaces for Defense Production" and printed in three colors, has just been issued by Surface Combustion Corporation. The bulletin covers heating for forging as well as heat-treatments to develop the required properties for the production of all kinds of ordnance material. Among the items covered in the bulletin are ammunition, guns, tanks, aircraft, and ships. The production of engines, power transmission equipment, as well as tools and special parts, is also covered.

Copies of this bulletin (SC-150) may be obtained by writing to *Surface Combustion Corporation, Toledo, Ohio.*

New Publications

Residence & Migration of College Students, 1949–50

By Robert C. Story. Office of Education Miscellany No. 14. 61 pp., 35 cents, 1951. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

This report continues a series of studies by the Office of Education on the residence and migration of college students. The preceding survey covered the year 1938–39.

In former years, some information regarding the residence and migration of students was obtainable from the decennial federal census. The 1950 Census, however, counted each college student as a resident of the state in which his college is located. This changed practice makes this report the sole national source of information regarding the residence and migration of college students.

In addition to other special features, the report gives somewhat fuller consideration to the topic of foreign students in attendance in United States institutions of higher education.

What to Make With Concrete

Cloth, 112 pp., 6⅝ by 9½ in., illus., $2. Popular Mechanics Press, Chicago 11, Ill.

One of the Popular Mechanics Press series of interesting compilations that presents many projects for home and farm made of concrete.

The book contains many good illustrations and the directions are clear and concise.

Carving Animal Caricatures

By Elma Waltner. Paper cover, 96 pp., 7¾ by 10¼ in., illus., $1.50. McKnight & McKnight Publishing Co., Bloomington, Ill.

A provocative little book which will tempt many youngsters to try carving or whittling the interesting animal caricatures described and illustrated by the author.

Work Experience in High School

By Wilson H. Ivins and William B. Runge. Cloth, 507 pp., 6¼ by 9¼ in., $4.75. The Ronald Press Co., 15 E. 26th St., New York 10, N. Y.

An interesting book on the history, development, and spread of co-operative programs which are now becoming increasingly more numerous and more efficiently applied in the training of our youth in numerous occupations, trades, and professions, on the high school and college levels.

Vacuum-Tube Voltmeters

By John F. Rider and Alfred W. Barber. Cloth, 422 pp., 5¾ by 8½ in., illus., $4.50. John F. Rider, Publisher, Inc., 480 Canal St., New York 13, N. Y.

This is the second edition of this sourcebook on vacuum-tube voltmeters. It is thoroughly revised and brought up to date.

It will be useful to engineers in their work on design, and as a textbook. The questions at the end of each chapter will be found very helpful.

Metal Processing

By Orlan William Boston. Cloth, 763 pp., 6¼ by 9⅜ in., illus., $7.50. John Wiley & Sons, New York 16, N. Y.

This is the second edition of this comprehensive college text on machine-shop power tools, the materials on which these tools are used, and the proc-

(Continued on page 41A)

Today's Student...Tomorrow's Master...
Build the right HABIT now by having your classes use
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Drawing Pencil of the Masters
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This course was not designed as a substitute for existing courses, but as a prerequisite or alternative. It meets your objectives.

It interprets fundamental industrial technology for students.

It provides valuable Life Adjustment material.

It explores the students' aptitude for drafting.

It teaches those fundamental drawing and drafting skills that are universally desirable in business and industry.

The salient feature of the new book is its realistic application to the needs of everyday life. Even if a student finds that his aptitude for, or his interest in, drawing is not sufficient to warrant further study upon completion of this course, he has received valuable training he will use all his life.

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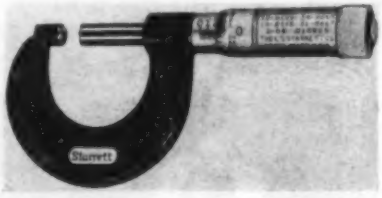
Chicago 37, Illinois

SHOP EQUIPMENT NEWS

NO. 211 STARRETT MICROMETER WITH ROUNDED ANVIL

The L. S. Starrett Company has just developed a useful micrometer for measuring the wall thickness of bearings, tubing, and cylinders having walls up to 1 in. thick and any diameter all the way down to 5/8 in. I.D.

Since the anvil contact is rounded, any of the above curved surfaces can be accurately measured in thousandths of an inch. Conventional micrometers having flat contact faces cannot be used for this purpose.



No. 211 Starrett micrometer with rounded anvil

The frame is strongly ribbed and finished in smooth black enamel which is easy to keep clean. Thimble and sleeve have rust resistant, "Satin Chrome Finish," against which markings stand out sharply. Graduations are quick reading with every thousandth numbered for fast, error-proof reading. The spindle has one piece construction with threads hardened, stabilized, and ground from the solid. The spindle face has Hi-Micro mirror-like finish for lasting precision. A simple sleeve adjustment maintains accuracy.

For further information, address *The L. S. Starrett Co., Athol, Mass.*

For brief reference use IAVE—0901.

THE HESTON AND ANDERSON XPEDITOR, AND THE NEW MODEL 5860 JOINTER

Heston and Anderson, Fairfield, Iowa, have just perfected two new machines which will greatly aid in increasing production.

The first of these power tools is known as the Xpeditor. This machine consists of an ingenious abrasive belt arrangement which cuts at 5700 s.f.p.m.

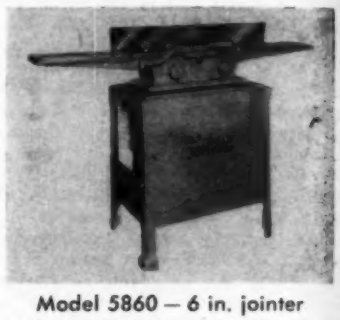
It is equipped with a resilient backing under the abrasive belt, and can be used for line contact grinding, precision platen grinding, and free belt grinding and polishing.

It may be quickly set to any angle so that the workman can do the work more easily and efficiently.

Mounting a new abrasive belt is the work of seconds. This is very advantageous and assists greatly in always using the right kind of grit.

This firm has also produced a new 6-in. Jointer Model 5860 which is very substantially made.

The new Heston and Anderson Xpeditor



Model 5860 — 6 in. jointer

It can do the work ordinarily assigned to an 8-in. jointer. It has a 60 by 8-in. heavily ribbed gray iron table; a rabbeting capacity of 3/4 by 6 in.; an extra large drop forged cutter head; a 37 by 4-in. fence; and a depth of cut gauge with a depth of cut adjuster.

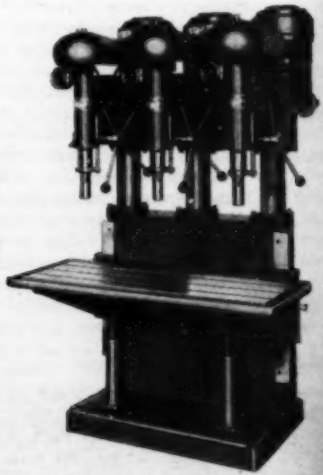
For further information on either or both of these machines, write to *Heston and Anderson, Fairfield, Iowa.*

For brief reference use IAVE—0902.

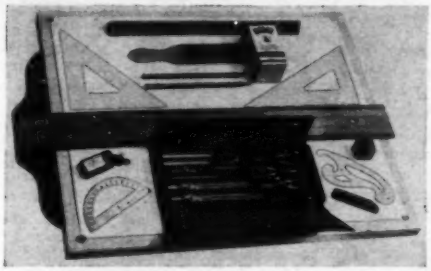
MULTIPLE SPINDLE DRILLING MACHINE

Sibley Machine & Foundry Corp., South Bend, Ind., has just introduced an entirely new design for multiple spindle drilling machines. With three spindles mounted integral to a sturdily constructed column, this Model ME-25 is suited to high volume production.

(Continued on page 38A)



Sibley Multiple drilling machine



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SHOP EQUIPMENT NEWS

(Continued from page 36A)

The machine is of medium weight, has a big 25-in. swing, a variable speed drive from which the exact spindle speeds may be obtained for any size drill from 1/8 to 1 in., and an extra large table with coolant trough.

It is powered by a 1½-h.p. axial air gap motor. Capacity of machine is ¾ in. in steel and 1 in. in cast iron. Distance between spindles is 14⅞ in. Table has a vertical adjustment of 12¼ in. Working surface of table is 45 by 14½ in. Net weight with motors is 2165 lb.

For further information, write for Catalog No. 70 to *Sibley Machine & Foundry Corp., South Bend, Ind.*

For brief reference use IAVE—0903.

NEW ABRASIVE-BELT CATALOG

The Porter-Cable Machine Company has just issued its New Abrasive Belt Machine Catalog. In addition to containing a factual description of Abrasive-Belt Machines it is also a basic manual on the subject. Information on each machine is very comprehensive, including a basic description of the machine, its operation, and the scope of its uses.

For a copy of this catalog write to *The Porter-Cable Machine Co., Syracuse 8, N. Y.*

For brief reference use IAVE—0904.

SKIL HOME SHOP POWER CHEST MODEL 582

The new Skil Home Shop Power Chest Model 582, introduced by Skilsaw, Inc., portable electric tool manufacturer, is designed to give the user a complete household workshop in one compact kit.

Included in the contents of the power chest are: model 517 sander-polisher, 3-in. grinding wheel, arbor adapter, lamb's-wool bonnet, 3 sanding disks, ½-in. hex-key drill chuck, horizontal bench stand, set of 7 twist drills, rubber pad, steel backing disk, and pint can of Skil auto polish.

The sander-polisher has a speed of 3000 r.p.m. It weighs only 4 lb., and has a 6-in. diameter sanding or polishing surface. With the power chest, it can be used as either a freehand tool or a power unit for bench stand sanding and grinding. Weight of complete kit is 17½ lb.

Optional accessories for use with the power chest are available.

For further information write *Skilsaw, Inc., 5033 Elston Ave., Chicago 30, Ill.*

For brief reference use IAVE—0905.

Skil Power Chest Model 582

SHOP PLANNING SERVICE

The Walker-Turner Division of Kearney & Trecker Corporation announces a new shop planning service for schools. With the aid of carefully scaled models and movable walls the education department can set up a miniature shop to fit any floor plan in the wood, general metal, or composite shop areas, and submit an 8 by 10 photo showing the results in true perspective. The models cover not only the outstanding Walker-Turner power tools but include related equipment such as cabinets, benches, and other machines to indicate a well-balanced program of industrial education.

For further information contact nearest Authorized Walker-Turner Dealer or write to *Walker-Turner Division, Plainfield, N. J.* Attention: Education Department.

For brief reference use IAVE—0906.

BLACK & DECKER INCREASES ITS BUFFALO FACILITIES

The Black & Decker Mfg. Co., producer of portable electric tools, opened a large new sales and service branch at 881 W. Delavan Ave., Buffalo 9, N. Y., on February 1, 1951.

The new building covers over 4100 sq. ft., and increases sales and service facilities nearly 400 per cent over the previous Buffalo location. In addition almost 7000 sq. ft. of parking area is provided in the rear of the new location for customers.

Complete service facilities including a greatly increased stock of genuine replacement parts for Black & Decker, Van Dorn, and Home-Utility Electric Tools will be provided, manned by factory-trained mechanics. A large showroom displaying the company's nearly 150 different products is also included in the building.

For brief reference use IAVE—0907.

(Continued on page 40A)

Too many drafting students and not enough room?

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HERE'S HOW IT WORKS—This simple, sturdy, good-looking Student Drafting Table Assembly is composed of three units, giving it real space-saving flexibility. The Assembly consists of the table (V-1620), the tool drawer unit (V-1621) and the board storage unit (V-1623). Storage units can be arranged to make maximum use of floor space.

FOR EXAMPLE—An entire aisle can be eliminated by placing two rows of tables together. The left-hand row would have the tool drawer unit at right-front and the board storage unit at left-rear, opening to the left-hand aisle (as illustrated). Storage unit arrangement in the right-hand row would be reversed.

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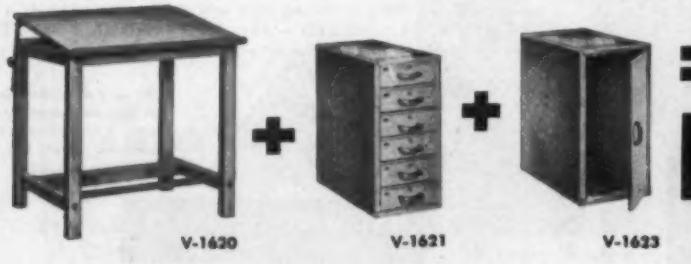

V-1620 V-1621 V-1623

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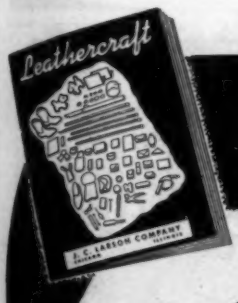

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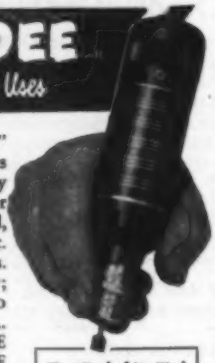

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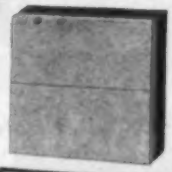

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SHOP EQUIPMENT NEWS

(Continued from page 38A)

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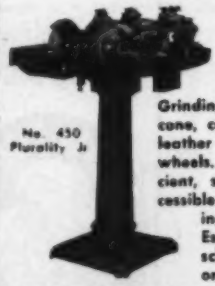

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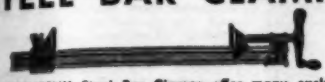

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(Continued from page 35A)

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Domestic Oil Burners: Installation and Servicing

By Charles H. Burkhardt. Cloth, 359 pp., 6¼ by 9¼ in., illus., $4.50. McGraw-Hill Book Co., New York 18, N. Y.

A book that may be used by students in the classroom or by the field men who want to know more about the burners that they have to install.

The book contains many illustrations. The questions at the end of the chapters will be found very useful by those who want to make a study of this subject.

Creative Hands

By Doris Cox and Barbara Warren. Cloth, 381 pp., 7¼ by 10 in., illus., $6.50. John Wiley & Sons, Inc., New York 16, N. Y.

The education and teaching experiences of the two authors of this book are a guarantee that the articles described in their book are artistically designed, well made, and, where necessary, pleasingly decorated with carvings, colors, etc. Weaving, embroidery, decorative drawings, for things made of wood, buttons of wood and metal, leather, block cutting and printing, bookbinding, and metal etching work are all covered.

Occupational Information: Its Nature and Use

By Max F. Baer and Edward C. Roeber. Cloth, 603 pp., 5¾ by 8 7/16 in., $5.75. Science Research Associates, Inc., Chicago, Ill.

A text in the field of counselor-preparation and self-improvement. It contains up-to-date facts about occupational information — where to get it; how to evaluate it; how to use it; and how to check on its effectiveness. The book also contains a comprehensive listing of occupational sources, references, examples, and techniques. It is designed for both counselors-in-training and counselors-in-service.

Ideas on Film

Edited by Cecile Starr. Cloth, 251 pp., 6 3/16 by 9¼ in., illus., $4.50. Funk & Wagnalls Co., 153 East 24th St., New York 10, N. Y.

A handbook for 16mm. film users. It contains a compilation of 29 articles by more than 20 experts who appraise and discuss the problems and prospects of the documentary and educational film in this country.

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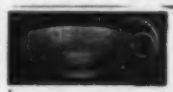

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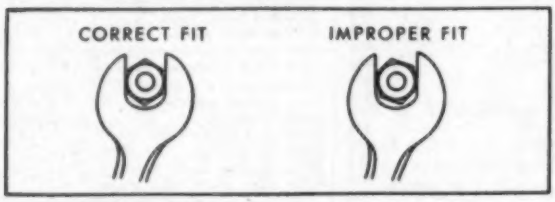
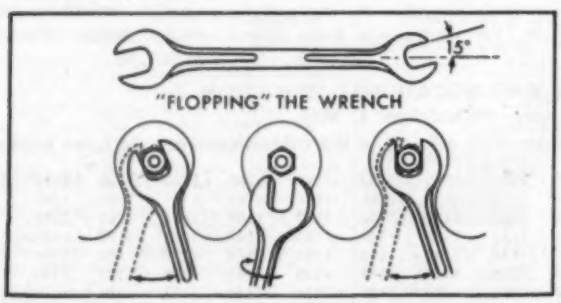
Memo to mechanics

How to do it right with WILLIAMS OPEN END WRENCHES

Wrench openings are designed to allow for commercial tolerances or variations in nut and bolt manufacture. However, in selecting the correct opening size, a minimum of play should exist between jaws of the wrench and flats of the nut. Too large an opening may slip under a hard pull and will tend to round the corners of the nut causing undue wear on the jaws of the wrench.



The openings of most open-end wrenches are at a 15° angle to the handle. This feature makes it possible to completely rotate hex nuts where swing is limited to only 30° by "flopping" the wrench. Always *pull* on a wrench unless of course there is no other choice. Pushing on a wrench is dangerous and may end in injury to the hands. Hammering on a wrench or slipping a pipe over the handle to increase leverage puts a strain on the jaws which they were not designed to take. This practice usually results in spreading the jaws beyond further use. Long handle or striking face wrenches should be used on frozen nuts or where nuts must be set extremely tight.



To insure maximum service from an adjustable wrench it is important that it be used in the correct

manner. Always place wrench on the nut so that the pulling force is applied to the stationary or immovable jaw. The adjusting knurl should be tightened so that the jaws fit the nut snugly. Williams "Superjustable" Wrenches are available in sizes 4" to 24" with capacities up to 2-7/16".

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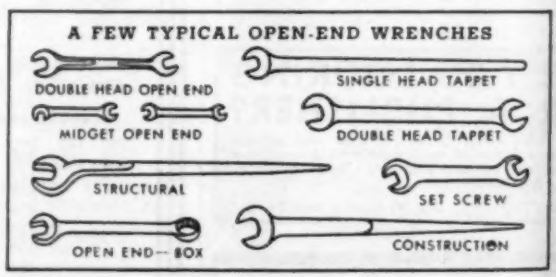

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